EDUCATIONAL PSYCHOLOGY

DEVELOPING LEARNERS

ELEVENTH EDITION

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Eleventh Edition

Educational Psychology

Developing Learners

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Dedication

To our parents Gloria and Arthur, Myra and Noel,
and our children Sarah and Jacob
—*Eric and Lynley*

To Jack
—*Jeanne*

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About the Authors

Eric M. Anderman holds a B.S. degree from Tufts University, an Ed.M. from Harvard University, and a Ph.D. in Educational Psychology from The University of Michigan. After completing his Masters degree, he worked as a high school and middle school teacher for several years, before returning to graduate school. He is currently Professor of Educational Psychology and of Quantitative Research, Evaluation, and Measurement at The Ohio State University. His research focuses on (a) academic motivation, (b) academic cheating, (c) motivation and risky behavior during adolescence, and (d) violence perpetrated against educators. He is currently the editor of the journal *Theory into Practice*, and formerly was associate editor of the *Journal of Educational Psychology*. He has published over 100 articles and chapters. In addition to this book, he co-authors the textbook *Adolescent Development for Educators*, with Alison Ryan and Tim Urdan (also published by Pearson). He also is co-author with Lynley Anderman of *Classroom Motivation: Linking Research to Teacher Practice* (now in its third edition) and he co-edited the third edition of the *Handbook of Educational Psychology* with Lyn Corno and *The Visible Learning Guide to Student Achievement* with John Hattie. He also is the author of the book *Sparking Student Motivation: The Power of Teachers to Rekindle a Love for Learning*.

Lynley H. Anderman received her B.A. and M.A. (Hons.) in Education from the University of Auckland, New Zealand, and her Ph.D. from the Combined Program in Education and Psychology at The University of Michigan. A graduate of North Shore Teachers College (Auckland, New Zealand), she taught for several years in primary and intermediate schools in Auckland. Currently, she is Professor of Educational Psychology (Emerita) at The Ohio State University. She has published and presented extensively on academic motivation, particularly in relation to the roles of instructional and social-relational characteristics of classrooms that support students' motivation and engagement, including students' sense of belonging, teacher–student and peer relationships. She also has written and presented on the role of educational psychology in teacher education. Dr. Anderman is the former editor of the *Journal of Experimental Education*, and former associate editor of *Theory into Practice*. She is co-author of *Classroom Motivation: Linking Research to Teacher Practice* (now in its third edition), and has co-edited *Psychology of Classroom Learning* (published by Cengage) and *Teaching to Prepare Advocates* (published by Information Age).

Jeanne Ellis Ormrod received her A.B. in psychology from Brown University and her M.S. and Ph.D. in educational psychology from The Pennsylvania State University. She earned licensure in school psychology through postdoctoral work at Temple University and the University of Colorado at Boulder and has worked as a middle school geography teacher and school psychologist. She was Professor of Educational Psychology at the University of Northern Colorado until 1998; she is currently Professor Emerita there. She has published and presented extensively on cognition and memory, cognitive development, instruction, and related topics but is probably best known for this book and four others: *Human Learning* (currently in its eighth edition); *Essentials of Educational Psychology* (now in its sixth edition and now coauthored with Brett D. Jones); *Child Development and Education* (co-authored with Teresa McDevitt, now out in its seventh edition); and *Practical Research: Design and Process* (recently released in its thirteenth edition). She and her husband Richard live in New Hampshire, where (she is happy to report) she is within a 90-minute drive of her three young grandchildren.

Preface

About this Book

*Educational Psychology: Developing Learner*s (Eleventh edition) presents cutting-edge, up-to-date research on teaching and learning in conversational language for preservice and inservice education professionals. The material is presented throughout the book in an applied manner, with contemporary examples reflecting the lived experiences of teachers and students in today's classrooms. Each chapter attends to the developmental, social, and cultural diversity of our classrooms.

New to This Edition

The new edition continues to include many of the features that have made previous editions of the book so popular with instructors and students, including a conversational writing style, "Experiencing Firsthand" features, organizational tables and diagrams, a focus within each chapter on both developmental issues and diversity, and an emphasis on classroom applications. Yet there are also significant changes. We have re-ordered some of the chapters based on feedback from users. Specifically, after the first five chapters (which have not changed in order), we reorganized a few chapters so that there would be a more chronological flow to the groupings of chapters. Thus in the eleventh edition, Chapters 6–9 focus on various theories of learning, having moved Chapter 9 (which focuses on behaviorist views on learning) to Chapter 6. In the new edition, content on different aspects of student motivation are distributed across Chapters 10 and 11, reducing the amount of content previously covered solely in Chapter 11. We also have added new sections on both engagement and socioemotional learning (which were not discussed in detail in previous editions) into the new Chapter 11. We moved Chapter 13 (which focuses on creating supportive learning environments) to Chapter 12, so that the sections on motivation and emotion now serve as a transition into discussions of how to create supportive classroom environments. Finally, we moved the content on instruction in the content areas (e.g., language arts and mathematics) from Chapter 8 to Chapter 13; thus Chapter 13 now focuses exclusively on instructional practices—starting out with a general discussion of practice, and moving into a section on specific content areas. We also substantially revised the chapter on complex cognitive processes (which is in the new Chapter 8) so that all of the material on self-regulation (including strategies for teaching students to become self-regulated learners) is now presented in one single chapter.

All 15 chapters have been updated to reflect recent advances in research, theory, and classroom practices. In this edition, we have continued with our efforts to discuss technology throughout the book. In particular, we acknowledge and openly discuss the ways in which the Covid-19 pandemic has affected technology use in classrooms. We also have added several new "Experiencing Firsthand" activities. We have continued to enhance the eTextbook, so that readers can regularly apply what they are learning to actual and hypothetical classroom scenarios and problems. Interactive features include Learning Objective Quizzes, Application Exercises, and case study analyses in the Licensure Exam activities; all of these features ask readers to respond to either open-ended or multiple-choice questions, and then give readers immediate feedback about their responses. Such features, along with many hotlinked Video Examples and Video Explanations—the latter of which target concepts and principles that students in educational psychology classes sometimes struggle to understand and apply—make the eleventh edition of the book a truly multimedia learning experience. In this edition of *Educational Psychology: Developing Learners*, Eric and Lynley Anderman revised all of the chapters.

Key Content Updates by Chapter

More specific additions and changes to this edition include the following:

- **Chapter 1:** Descriptions of the various types of quantitative research have been rewritten so that they are explained in more straightforward, nontechnical language, with examples that directly reflect research questions focusing on teachers and students.
- **Chapter 2:** Added updated content on neuroscience, along with a discussion of the need to use caution when applying brain research to teaching and learning; added a sample assignment aligned with the concrete operational level of cognitive development; added a discussion of why Piaget's and Vygotsky's theories can both be simultaneously applied to support student learning; added a table addressing contemporary "myths" about bilingual children.
- **Chapter 3:** Added a new case study on how one teacher was surprised about the diversity of interests expressed by her students; updated the section on family dynamics to reflect both the importance of considering larger social contexts and the ways in which parents exert control; condensed the section on Erikson's stages to more succinctly focus on implications for teaching and learning; added a summary table describing various crowd groups; added a new "Experiencing Firsthand" feature on perspective-taking with regard to wearing masks during the Covid-19 pandemic; added a discussion on using collaborative social reasoning to enhance social reasoning; added additional discussion of how adolescents are using social media with their peers.
- **Chapter 4:** Added an updated case study on immigration; added information about nonacademic factors that affect achievement; added a section on cultural differences in norms for personal space; added a new section discussing current conceptions of gender, sex, and gender nonconformity (including a new table of current terms and phrases); increased focus on sexual minority students being at risk of experiencing academic and psychological difficulties.
- **Chapter 5:** Reduced discussion of history of research on intelligence, while improving focus on applications to teaching and learning; updated information on prevalence of ADHD; added data from CDC on prevalence of psychological problems by age; increased discussion of disproportionality of ethnically diverse students in gifted and special education programs; included a new discussion of use of virtual reality to support learning in students with special needs.
- **Chapter 6 (formerly Chapter 9):** We reorganized a few of the chapters on theories of human learning, in order to provide a more streamlined approach to instruction. We begin this set of chapters with the revised chapter on behaviorist views of learning. The chapter begins with an updated section describing basic assumptions of all theories of learning. We then present classical conditioning, emphasizing some examples of how classical conditioning can help to explain some students' physiological responses to classroom phenomena. This section includes a new discussion of spontaneous recovery (i.e., the re-emergence of a seeming previously extinguished conditioned response).

  In the section on instrumental conditioning, we have added a figure that should help students to understand the many different types of reinforcers that can be used in classrooms. We added a new section on "Timing of Reinforcers" in order to help prospective teachers understand that reinforcement schedules can have significant effects on students' learning. We also have updated the section on punishments to help students understand the distinctions between reinforcement and punishment.
- **Chapter 7 (formerly Chapter 6):** This chapter includes a new case study focusing on students' varying approaches to memorization tasks. The sections discussing

various aspects of the Information Processing model now include updated examples. We also have integrated new research on human memory (e.g., the role of memory capacity in achievement; the use of yoga to reduce students' stress and support cognitive processes) into the text along with examples applying this to school settings, as well as applied explanations of recent research on the role of memory capacity in math and reading achievement. We also discuss the ever-changing role of technology in student learning, particularly with regard to ways in which the Covid-19 pandemic has changed educators' use of technology. This chapter also includes a new "Experiencing Firsthand" feature, focused on long-term memory.

- **Chapter 8 (formerly Chapter 7 and part of Chapter 10):** The chapter includes updated suggestions for ways to incorporate technology into instruction to support problem solving (e.g., through video recordings), as well as updated applied research on reducing misconceptions and building students' problem-solving strategies. The chapter also contains a new "Experiencing Firsthand" feature on critical thinking.

  The biggest change to this chapter is that we have moved the discussion of self-regulation (and self-regulated learning strategies) into one place. Although much of the discussion of self-regulation appeared in Chapter 10 in the previous edition, there were various sections discussing aspects of self-regulated learning (SRL) in other chapters as well. All of that information has now been integrated into an updated section in this chapter. We begin by explaining what self-regulation is and discussing developmental considerations. We then provide a framework for prospective teachers to see how they can support SRL in their future students, by breaking SRL down into three components (SRL before starting a task, while doing a task, and after completing a task). We have also expanded the discussion of cultural differences that can affect SRL.
- **Chapter 9 (formerly Chapter 8):** This chapter has been updated to focus more specifically on sociocultural perspectives on learning, and less on the instructional practices that are associated with various content domains (the section on learning within subject domains has been moved to Chapter 13, formerly Chapter 12). The chapter begins with a new case study on immigration, which is designed to introduce students to the importance of considering the effects of contexts on learning. The chapter also includes updated examples with regard to culture, including a new discussion of families as communities of practice. The section that examines digital technologies as contexts has been updated to reflect the increased use of technology for instruction that has occurred since the onset of Covid-19, along with updated information and statistics regarding children's and adolescents' social media and technology use. We have added a new example of a curricular innovation designed to encourage schools to work collaboratively (using technology) to discuss complex issues that may have more than one solution. The chapter concludes with an updated discussion of the ways in which a variety of aspects of student diversity (e.g., in terms of family structure, culture, gender, etc.) need to be considered when examining contextual influences on learning.
- **Chapter 10:** Both Chapters 10 and 11 have been significantly updated, reorganizing the substantial content on student motivation. Although social cognitive theory was included in Chapter 10 in the previous edition, we have reframed the discussion of social cognitive theory so that the theory serves as a "bridge" between the chapters on learning theories and the chapters on motivation. As noted earlier, the portions of Chapter 10 that focused on self-regulated learning have been moved to Chapter 8 in this edition.

  In the previous edition, Chapter 11 included a great deal of content on student motivation, resulting in a chapter that was considerably longer than most. In addition to newly emerging research in this area, we have now added sections on student engagement and social-emotional learning. To accommodate this content, we have reorganized that material across two chapters.

Some of the content that was included in Chapter 11 in the prior edition has been moved into Chapter 10. We begin by introducing some basic definitions and tenets of motivation (e.g., intrinsic and extrinsic motivation). Then, we organize our discussion of motivation around questions that students ask themselves while engaged in learning tasks. The three questions addressed in Chapter 10 are (1) Can I do this? (2) Would I want to do this? and (3) If I do this, will it meet my needs? Theories and implications for instruction are introduced within the discussions of each of these questions. Thus social cognitive theory (e.g., self-efficacy) is discussed in response to "Can I do this?"; expectancy-value theory is discussed in response to "Would I want to do this?"; that section also includes updated information about brief motivation interventions, and how some of those can be adapted for use in future educators' classrooms. Self-determination theory is discussed in response to the third question.

- **Chapter 11:** Chapter 11 also has been substantially revised. The chapter again is organized around questions that students might ask themselves. These include (1) What is my goal when I'm doing this? (2) What are my teachers' beliefs and expectations for me? and (3) How do I feel when I'm working on academic tasks? Achievement goal theory and related conceptions of students' goals are introduced in response to the first question. This section also includes discussions of mindsets and attribution theory. The section framed around the second question focuses on teacher expectations and attributions. New to this edition, the chapter includes a section focusing on similarities and differences between motivation and engagement. We discuss different types of engagement (e.g., cognitive, behavioral, emotional, and agentic engagement), and implications for instruction. Affect (i.e., emotion) is discussed in the section framed around the third question. Also new to this edition is a section on socioemotional learning that has been incorporated into this part of Chapter 11.
- **Chapter 12 (formerly Chapter 13):** We moved the chapter on creating a setting that is supportive of learning to Chapter 12, so that there would be a meaningful flow of conversations about motivation, engagement, and socioemeotional well-being (as covered in Chapters 10 and 11) into topics of creating positive environments (in Chapter 12). There is a greater emphasis in the new edition on thinking about the topics covered in Chapters 10 and 11 as strategies to create engaging classroom environments. For example, in the section on "Creating an Effective Psychological Climate," clearer references are made to the topics covered in the previous chapters. We also moved the discussion of applications of the TARGET acronym from Chapter 11 into Chapter 12, since it aligns with the updated focus of this chapter. We have revised the section on aggression and violence at school to reflect updated research on prevalence, bullying, and cyberbullying. In addition, greater attention is paid to considering student diversity as teachers work toward creating supportive learning environments.
- **Chapter 13 (formerly Chapter 12 and parts of Chapter 8):** This chapter has been substantially revised. The major change is that the updated sections on teaching in the content areas (e.g., math, science, etc.) have been moved from Chapter 8 into this chapter. Thus, the entire chapter now focuses on instruction. Moreover, the sections on teaching in the content areas can now be examined with regard to motivation and engagement (since these sections now come after Chapters 10 and 11). We also expanded the section on using technology for instruction, replacing the prior focus on websites to reflect more updated technologies and platforms. We have expanded the section on using technology to support collaborative learning to reflect changes in available technological platforms. The discussion of considerations of group differences has been revised substantially as well.
- **Chapter 14:** Just as Chapters 12 and 13 have been revised to reflect on how educators can create engaging learning environments for their students, this chapter also has been updated to focus more on integrating the previous chapters on learning and motivation with the forms of assessment that are used in the classroom. The section on feedback has been updated with additional application examples.

We also updated some of the language in this chapter, no longer focusing on "paper and pencil assessments," but rather, focusing more broadly on diverse types of assessment strategies.

- **Chapter 15:** This chapter now includes updated information about standardized assessments, with the goal of providing prospective educators with the background knowledge that they will need in order to be able to understand the types of assessments that are given to students of various ages, as well as how to carefully and critically interpret the results. We have added information describing how many assessments provide scores indicating proficiency (e.g., below proficient, proficient, advanced). We also have added a new "Experiencing Firsthand" feature that gives prospective educators the opportunity to practice analyzing class test results using a variety of measures of central tendency (i.e., using the standard deviation in addition to the mean score). The chapter also acknowledges the effects of the Covid-19 pandemic on the use of standardized testing.

General Rationale for the Book

As teachers, we play critical roles in the lives of children and adolescents. Some of us help them learn to read and write. Some of us help them understand their physical and social worlds through explorations of science, mathematics, geography, history, foreign languages, or literature. Some of us help them express themselves through physical movement, the visual arts, or music. And some of us teach them specific skills they will need as adult professionals in, say, auto mechanics, cooking, or new technologies. But regardless of the subject matter we teach, we help those in the generations that follow us to become knowledgeable, self-confident, and productive citizens.

In our minds, teaching is the most rewarding profession we could possibly choose. Yet it's often a challenging profession as well. Students don't always come to us ready or eager to learn. How can we help them develop the knowledge and skills they need to become productive adults? What strategies can we use to motivate them? What tasks and instructional materials are appropriate for students at different developmental levels? Are the instructional practices that we use sensitive to the diversity of our students? Over the years, researchers and practitioners have worked together to answer such questions. Collectively, we're in the fortunate position of being able to benefit from the many insights that such experts offer.

All three of us have been teaching educational psychology for many years, and we've loved every minute of it. How children and adolescents learn and think, how they change as they grow and develop, why they do the things they do, how they're often very different from one another—our understandings of all of these things have innumerable implications for classroom practice and, ultimately, for the lives of young people. Because we want the field of educational psychology to captivate you the way it has captivated us, we've tried to make this book interesting, meaningful, and thought provoking as well as informative and timely.

Helping Our Readers Learn and Apply Educational Psychology

You can gain much more from your study of educational psychology when you:

- Focus on core concepts and principles of the discipline
- See these principles in action in your own learning and behavior
- Use the principles to understand the learning and behavior of children and adolescents
- Consistently apply the principles to classroom practice

You'll find numerous features throughout this book to help you do all of these things. We authors hope you'll learn a great deal from what educational psychology has to offer, not only about the students you may be teaching but also about yourself.

Focusing on Core Concepts and Principles

Rather than superficially explore every aspect of educational psychology, this book zeroes in on fundamental concepts and principles that have broad applicability to classroom practice. Throughout the book, core concepts appear in boldfaced blue font. Core principles are clearly identified within each section with boldfaced blue headings. See the following sections for some examples: *General Principles of Human Development* in Chapter 2 and *Basic Assumptions of Cognitive Psychology* in Chapter 7.

Seeing Concepts and Principles in Action in Your Own Learning

A central goal of this book has always been to help our readers discover more about themselves as thinkers and learners. Thus we include *Experiencing Firsthand* exercises throughout the book—exercises that illustrate such diverse concepts as constructive processes, working memory, sense of self, social cognition, ethnic stereotyping, and confidentiality in assessment. All of these exercises are designed to do exactly what their name implies: help our readers observe principles of educational psychology *in themselves*. See the sections on *The Nature of Working (Short-Term) Memory* and *Moving Information to Long-Term Memory* in Chapter 7 for some examples.

Understanding Children's and Adolescents' Learning and Behavior

Throughout the book we continually urge our readers to look closely at and try to make sense of what children and adolescents do and say. Each chapter begins with a *Case Study* that situates chapter content in a real-life scenario. We also make frequent use of *real artifacts* from children's journals and school assignments to illustrate concepts and principles in action. For example, see sections *Roles of Peers in Children's Development* in Chapter 3 and *How Knowledge Can Be Organized* in Chapter 7.

Examining Developmental Trends

Unique to this book is a focus on children's and adolescents' development in every chapter. For example, most chapters have one or more *Developmental Trends* tables that summarize age-typical characteristics at four grade levels (K–2, 3–5, 6–8, and 9–12), present concrete examples, and offer suggested classroom strategies for each level. You can find examples of these tables in the sections *Gender Differences* in Chapter 4 and *How Procedural Knowledge is Learned* in Chapter 7.

Applying Core Ideas of Educational Psychology to Classroom Practice

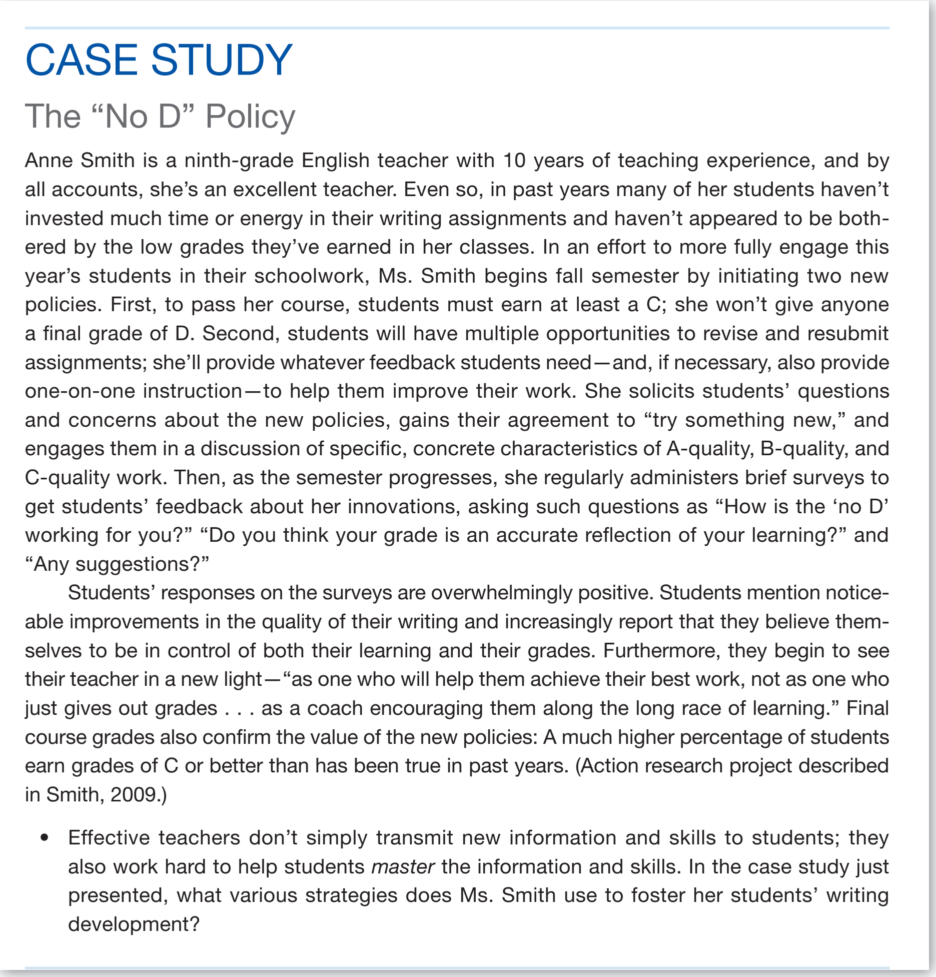
Throughout this text, psychological concepts and principles are consistently applied to classroom practice. We also provide *Into the Classroom* and *Creating a Productive Classroom Environment* boxes that suggest and illustrate strategies related to particular areas of concern for teachers. You can find examples in the sections *Contemporary Extensions and Applications of Vygotsky's Theory* in Chapter 2 and *How Knowledge Can Be Organized* in Chapter 7.

This book is consistently praised for its emphasis on application. Throughout the book we identify suggested strategies—within the text, in tables, and in the margins—with apple icons; for instance, see the *Applying Brain Research* feature in Chapter 2.

Helping You Prepare for Licensure

All chapters end with *Practice for Your Licensure Exam* exercises. These exercises provide readers with opportunities to use the content they've learned in a particular chapter to answer multiple-choice and constructed-response questions similar to those that appear on many teacher licensure tests. See the end of any chapter.

Pedagogical Features



CASE STUDY

The "No D" Policy

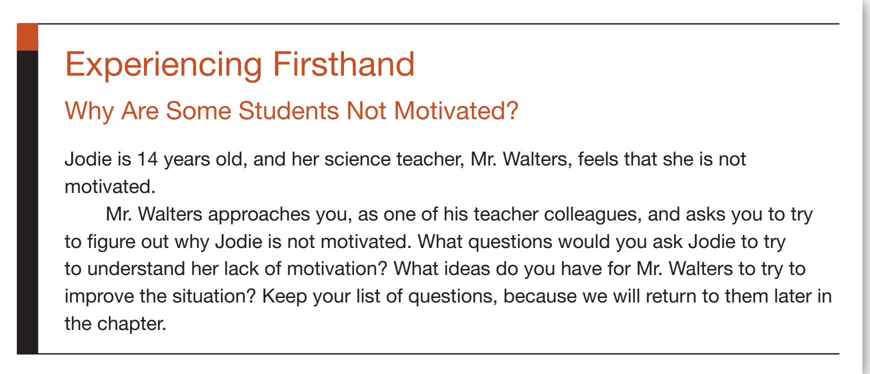
Anne Smith is a ninth-grade English teacher with 10 years of teaching experience, and by all accounts, she's an excellent teacher. Even so, in past years many of her students haven't invested much time or energy in their writing assignments and haven't appeared to be bothered by the low grades they've earned in her classes. In an effort to more fully engage this year's students in their schoolwork, Ms. Smith begins fall semester by initiating two new policies. First, to pass her course, students must earn at least a C; she won't give anyone a final grade of D. Second, students will have multiple opportunities to revise and resubmit assignments; she'll provide whatever feedback students need—and, if necessary, also provide one-on-one instruction—to help them improve their work. She solicits students' questions and concerns about the new policies, gains their agreement to "try something new," and engages them in a discussion of specific, concrete characteristics of A-quality, B-quality, and C-quality work. Then, as the semester progresses, she regularly administers brief surveys to get students' feedback about her innovations, asking such questions as "How is the 'no D' working for you?" "Do you think your grade is an accurate reflection of your learning?" and "Any suggestions?"

Students' responses on the surveys are overwhelmingly positive. Students mention noticeable improvements in the quality of their writing and increasingly report that they believe themselves to be in control of both their learning and their grades. Furthermore, they begin to see their teacher in a new light—"as one who will help them achieve their best work, not as one who just gives out grades . . . as a coach encouraging them along the long race of learning." Final course grades also confirm the value of the new policies: A much higher percentage of students earn grades of C or better than has been true in past years. (Action research project described in Smith, 2009.)

- Effective teachers don't simply transmit new information and skills to students; they also work hard to help students *master* the information and skills. In the case study just presented, what various strategies does Ms. Smith use to foster her students' writing development?

◀ Each chapter begins with a case study. These cases introduce key concepts that will be discussed in the chapter. The case studies should help instructors to frame the chapters within the real worlds of teachers and students.

▶ The Experiencing Firsthand exercises allow readers to gain insights into themselves as teachers and learners. These exercises are designed to help our readers observe how principles of educational psychology work in themselves.

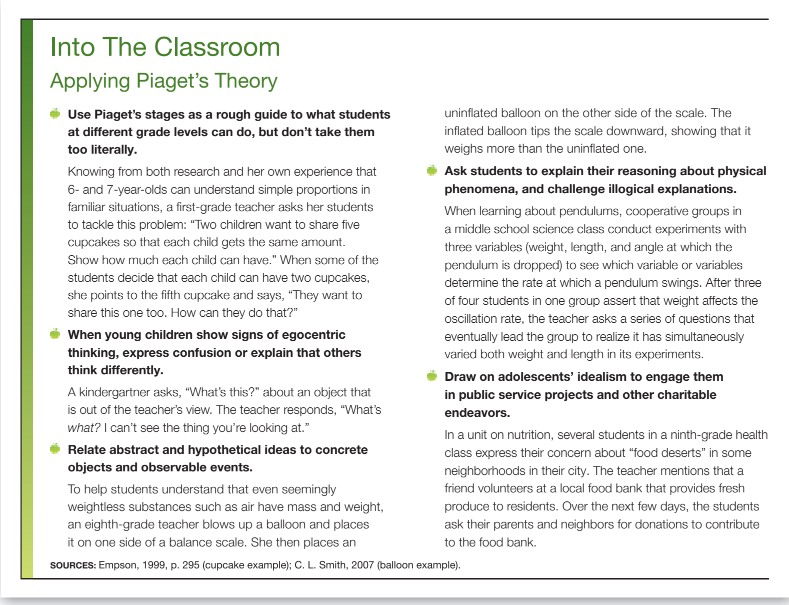


Experiencing Firsthand

Why Are Some Students Not Motivated?

Jodie is 14 years old, and her science teacher, Mr. Walters, feels that she is not motivated.

Mr. Walters approaches you, as one of his teacher colleagues, and asks you to try to figure out why Jodie is not motivated. What questions would you ask Jodie to try to understand her lack of motivation? What ideas do you have for Mr. Walters to try to improve the situation? Keep your list of questions, because we will return to them later in the chapter.



Into The Classroom

Applying Piaget's Theory

- **Use Piaget's stages as a rough guide to what students at different grade levels can do, but don't take them too literally.**

  Knowing from both research and her own experience that 6- and 7-year-olds can understand simple proportions in familiar situations, a first-grade teacher asks her students to tackle this problem: "Two children want to share five cupcakes so that each child gets the same amount. Show how much each child can have." When some of the students decide that each child can have two cupcakes, she points to the fifth cupcake and says, "They want to share this one too. How can they do that?"

- **When young children show signs of egocentric thinking, express confusion or explain that others think differently.**

  A kindergartner asks, "What's this?" about an object that is out of the teacher's view. The teacher responds, "What's *what?* I can't see the thing you're looking at."

- **Relate abstract and hypothetical ideas to concrete objects and observable events.**

  To help students understand that even seemingly weightless substances such as air have mass and weight, an eighth-grade teacher blows up a balloon and places it on one side of a balance scale. She then places an uninflated balloon on the other side of the scale. The inflated balloon tips the scale downward, showing that it weighs more than the uninflated one.

- **Ask students to explain their reasoning about physical phenomena, and challenge illogical explanations.**

  When learning about pendulums, cooperative groups in a middle school science class conduct experiments with three variables (weight, length, and angle at which the pendulum is dropped) to see which variable or variables determine the rate at which a pendulum swings. After three of four students in one group assert that weight affects the oscillation rate, the teacher asks a series of questions that eventually lead the group to realize it has simultaneously varied both weight and length in its experiments.

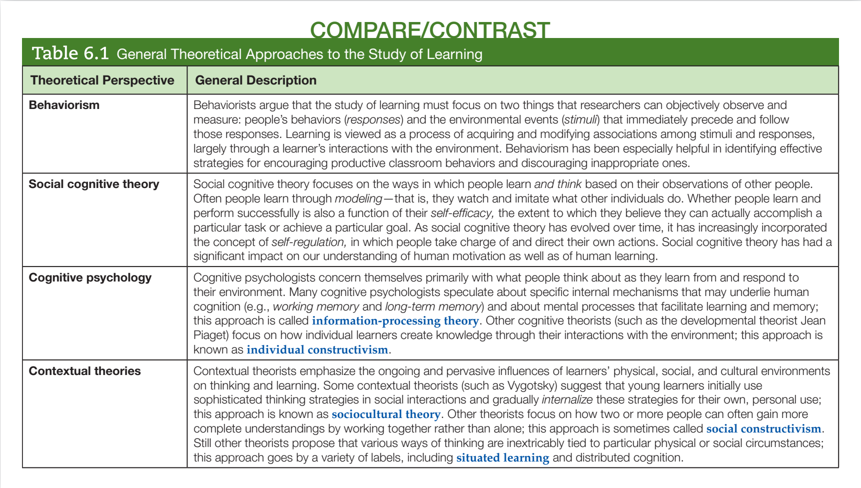
- **Draw on adolescents' idealism to engage them in public service projects and other charitable endeavors.**

  In a unit on nutrition, several students in a ninth-grade health class express their concern about "food deserts" in some neighborhoods in their city. The teacher mentions that a friend volunteers at a local food bank that provides fresh produce to residents. Over the next few days, the students ask their parents and neighbors for donations to contribute to the food bank.

SOURCES: Empson, 1999, p. 295 (cupcake example); C. L. Smith, 2007 (balloon example).

◀ The Into the Classroom boxes provide examples of specific practices that can be incorporated into daily instruction. All of the suggested practices are supported by research discussed within each chapter.

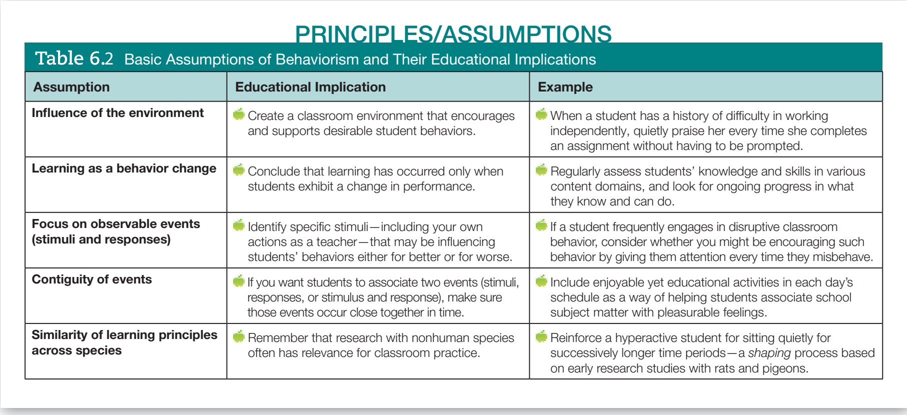
▶ Compare/contrast boxes provide summaries of theories or frameworks that are similar to each other. This feature helps readers to understand subtle and not so subtle similarities and differences across big ideas in educational psychology.



COMPARE/CONTRAST

Table 6.1 General Theoretical Approaches to the Study of Learning

Theoretical Perspective	General Description
Behaviorism	Behaviorists argue that the study of learning must focus on two things that researchers can objectively observe and measure: people's behaviors (*responses*) and the environmental events (*stimuli*) that immediately precede and follow those responses. Learning is viewed as a process of acquiring and modifying associations among stimuli and responses, largely through a learner's interactions with the environment. Behaviorism has been especially helpful in identifying effective strategies for encouraging productive classroom behaviors and discouraging inappropriate ones.
Social cognitive theory	Social cognitive theory focuses on the ways in which people learn *and think* based on their observations of other people. Often people learn through *modeling*—that is, they watch and imitate what other individuals do. Whether people learn and perform successfully is also a function of their *self-efficacy,* the extent to which they believe they can actually accomplish a particular task or achieve a particular goal. As social cognitive theory has evolved over time, it has increasingly incorporated the concept of *self-regulation,* in which people take charge of and direct their own actions. Social cognitive theory has had a significant impact on our understanding of human motivation as well as of human learning.
Cognitive psychology	Cognitive psychologists concern themselves primarily with what people think about as they learn from and respond to their environment. Many cognitive psychologists speculate about specific internal mechanisms that may underlie human cognition (e.g., *working memory* and *long-term memory*) and about mental processes that facilitate learning and memory; this approach is called **information-processing theory**. Other cognitive theorists (such as the developmental theorist Jean Piaget) focus on how individual learners create knowledge through their interactions with the environment; this approach is known as **individual constructivism**.
Contextual theories	Contextual theorists emphasize the ongoing and pervasive influences of learners' physical, social, and cultural environments on thinking and learning. Some contextual theorists (such as Vygotsky) suggest that young learners initially use sophisticated thinking strategies in social interactions and gradually *internalize* these strategies for their own, personal use; this approach is known as **sociocultural theory**. Other theorists focus on how two or more people can often gain more complete understandings by working together rather than alone; this approach is sometimes called **social constructivism**. Still other theorists propose that various ways of thinking are inextricably tied to particular physical or social circumstances; this approach goes by a variety of labels, including **situated learning** and distributed cognition.



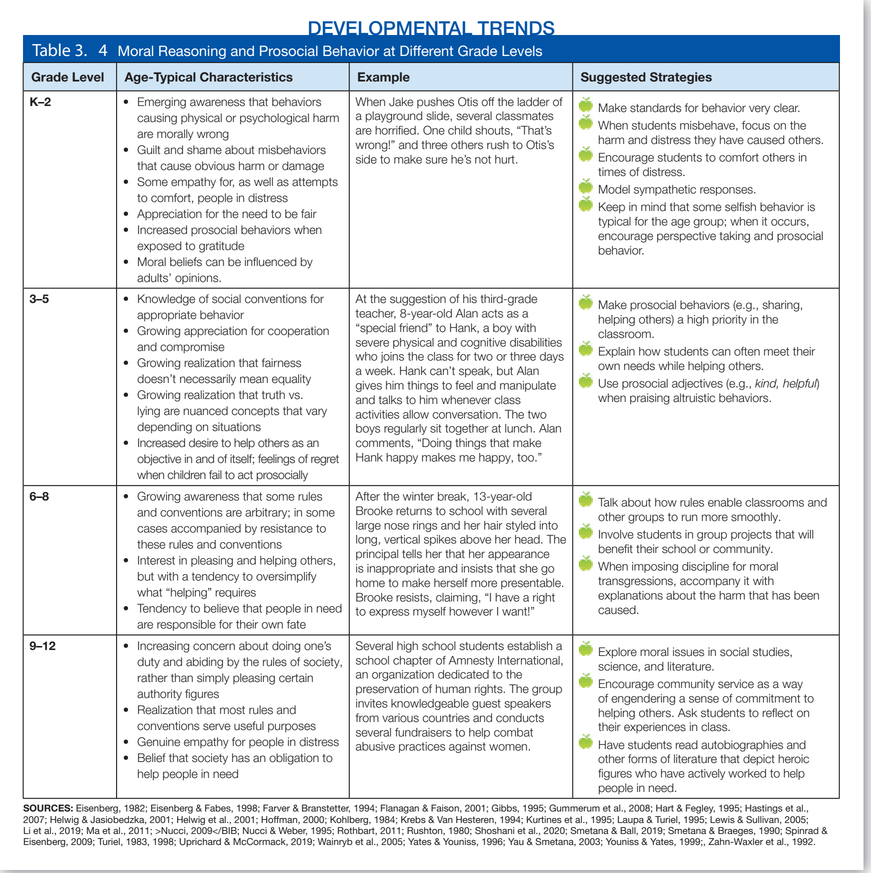
PRINCIPLES/ASSUMPTIONS

Table 6.2 Basic Assumptions of Behaviorism and Their Educational Implications

Assumption	Educational Implication	Example
Influence of the environment	Create a classroom environment that encourages and supports desirable student behaviors.	When a student has a history of difficulty in working independently, quietly praise her every time she completes an assignment without having to be prompted.
Learning as a behavior change	Conclude that learning has occurred only when students exhibit a change in performance.	Regularly assess students' knowledge and skills in various content domains, and look for ongoing progress in what they know and can do.
Focus on observable events (stimuli and responses)	Identify specific stimuli—including your own actions as a teacher—that may be influencing students' behaviors either for better or for worse.	If a student frequently engages in disruptive classroom behavior, consider whether you might be encouraging such behavior by giving them attention every time they misbehave.
Contiguity of events	If you want students to associate two events (stimuli, responses, or stimulus and response), make sure those events occur close together in time.	Include enjoyable yet educational activities in each day's schedule as a way of helping students associate school subject matter with pleasurable feelings.
Similarity of learning principles across species	Remember that research with nonhuman species often has relevance for classroom practice.	Reinforce a hyperactive student for sitting quietly for successively longer time periods—a *shaping* process based on early research studies with rats and pigeons.

◀ Principles/assumptions boxes provide summaries the core principles and assumptions associated with various theories or topic areas. For each core principal/assumption, we describe the educational implications of each, and provide a real-world example.

▶ The Developmental Trends tables emphasize that the topics covered in each chapter are best understood within a developmental framework. The ways that student learn and the ways that we teach students must always be viewed through a developmental lens, where grade levels and ages are considered.

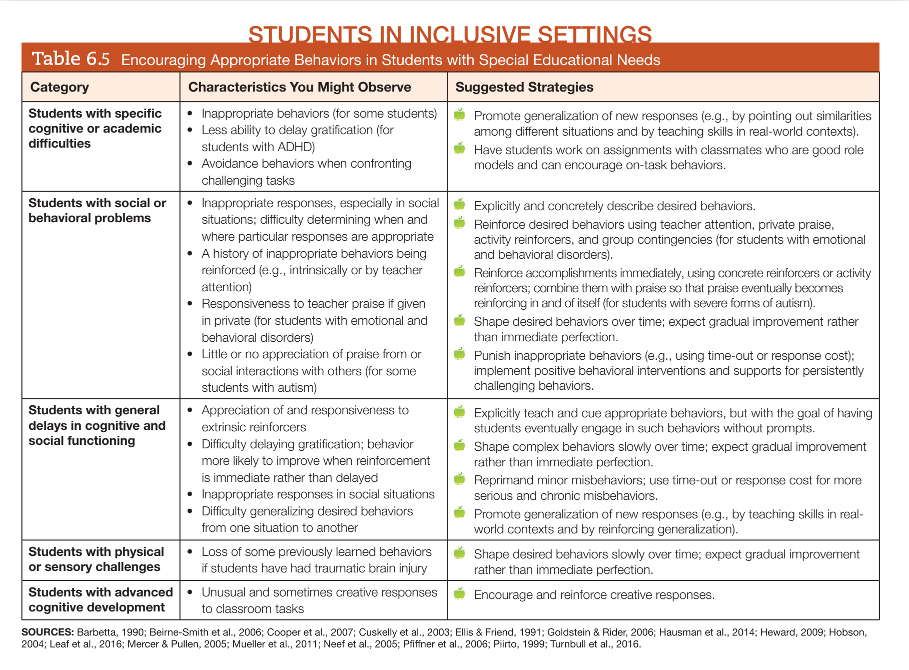


DEVELOPMENTAL TRENDS

Table 3. 4 Moral Reasoning and Prosocial Behavior at Different Grade Levels

Grade Level	Age-Typical Characteristics	Example	Suggested Strategies
K–2	• Emerging awareness that behaviors causing physical or psychological harm are morally wrong • Guilt and shame about misbehaviors that cause obvious harm or damage • Some empathy for, as well as attempts to comfort, people in distress • Appreciation for the need to be fair • Increased prosocial behaviors when exposed to gratitude • Moral beliefs can be influenced by adults' opinions.	When Jake pushes Otis off the ladder of a playground slide, several classmates are horrified. One child shouts, "That's wrong!" and three others rush to Otis's side to make sure he's not hurt.	Make standards for behavior very clear. When students misbehave, focus on the harm and distress they have caused others. Encourage students to comfort others in times of distress. Model sympathetic responses. Keep in mind that some selfish behavior is typical for the age group; when it occurs, encourage perspective taking and prosocial behavior.
3–5	• Knowledge of social conventions for appropriate behavior • Growing appreciation for cooperation and compromise • Growing realization that fairness doesn't necessarily mean equality • Growing realization that truth vs. lying are nuanced concepts that vary depending on situations • Increased desire to help others as an objective in and of itself; feelings of regret when children fail to act prosocially	At the suggestion of his third-grade teacher, 8-year-old Alan acts as a "special friend" to Hank, a boy with severe physical and cognitive disabilities who joins the class for two or three days a week. Hank can't speak, but Alan gives him things to feel and manipulate and talks to him whenever class activities allow conversation. The two boys regularly sit together at lunch. Alan comments, "Doing things that make Hank happy makes me happy, too."	Make prosocial behaviors (e.g., sharing, helping others) a high priority in the classroom. Explain how students can often meet their own needs while helping others. Use prosocial adjectives (e.g., *kind, helpful*) when praising altruistic behaviors.
6–8	• Growing awareness that some rules and conventions are arbitrary; in some cases accompanied by resistance to these rules and conventions • Interest in pleasing and helping others, but with a tendency to oversimplify what "helping" requires • Tendency to believe that people in need are responsible for their own fate	After the winter break, 13-year-old Brooke returns to school with several large nose rings and her hair styled into long, vertical spikes above her head. The principal tells her that her appearance is inappropriate and insists that she go home to make herself more presentable. Brooke resists, claiming, "I have a right to express myself however I want!"	Talk about how rules enable classrooms and other groups to run more smoothly. Involve students in group projects that will benefit their school or community. When imposing discipline for moral transgressions, accompany it with explanations about the harm that has been caused.
9–12	• Increasing concern about doing one's duty and abiding by the rules of society, rather than simply pleasing certain authority figures • Realization that most rules and conventions serve useful purposes • Genuine empathy for people in distress • Belief that society has an obligation to help people in need	Several high school students establish a school chapter of Amnesty International, an organization dedicated to the preservation of human rights. The group invites knowledgeable guest speakers from various countries and conducts several fundraisers to help combat abusive practices against women.	Explore moral issues in social studies, science, and literature. Encourage community service as a way of engendering a sense of commitment to helping others. Ask students to reflect on their experiences in class. Have students read autobiographies and other forms of literature that depict heroic figures who have actively worked to help people in need.

SOURCES: Eisenberg, 1982; Eisenberg & Fabes, 1998; Farver & Branstetter, 1994; Flanagan & Faison, 2001; Gibbs, 1995; Gummerum et al., 2008; Hart & Fegley, 1995; Hastings et al., 2007; Helwig & Jasiobedzka, 2001; Helwig et al., 2001; Hoffman, 2000; Kohlberg, 1984; Krebs & Van Hesteren, 1994; Kurtines et al., 1995; Laupa & Turiel, 1995; Lewis & Sullivan, 2005; Li et al., 2019; Ma et al., 2011; >Nucci, 2009</BIB; Nucci & Weber, 1995; Rothbart, 2011; Rushton, 1980; Shoshani et al., 2020; Smetana & Ball, 2019; Smetana & Braeges, 1990; Spinrad & Eisenberg, 2009; Turiel, 1983, 1998; Uprichard & McCormack, 2019; Wainryb et al., 2005; Yates & Youniss, 1996; Yau & Smetana, 2003; Youniss & Yates, 1999;, Zahn-Waxler et al., 1992.



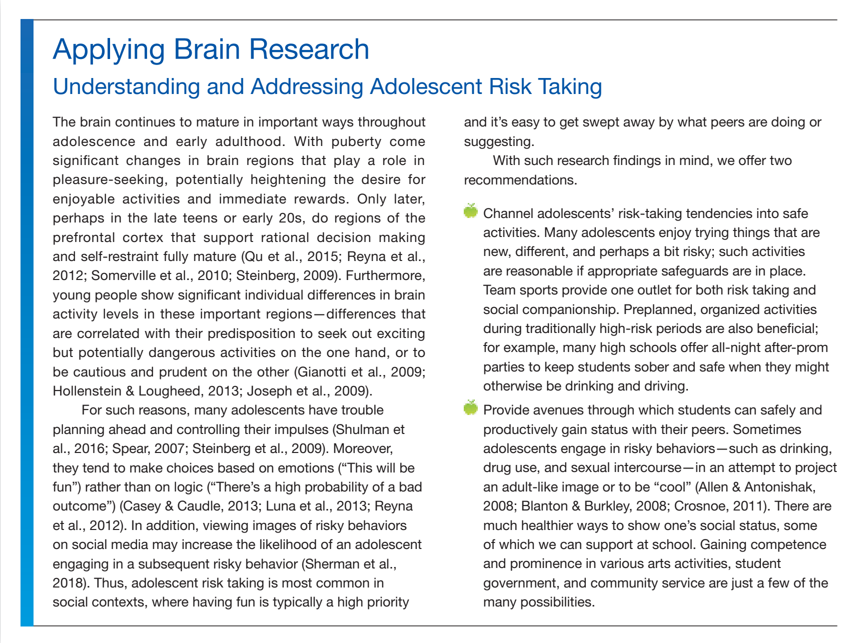
STUDENTS IN INCLUSIVE SETTINGS

Table 6.5 Encouraging Appropriate Behaviors in Students with Special Educational Needs

Category	Characteristics You Might Observe	Suggested Strategies
Students with specific cognitive or academic difficulties	• Inappropriate behaviors (for some students) • Less ability to delay gratification (for students with ADHD) • Avoidance behaviors when confronting challenging tasks	Promote generalization of new responses (e.g., by pointing out similarities among different situations and by teaching skills in real-world contexts). Have students work on assignments with classmates who are good role models and can encourage on-task behaviors.
Students with social or behavioral problems	• Inappropriate responses, especially in social situations; difficulty determining when and where particular responses are appropriate • A history of inappropriate behaviors being reinforced (e.g., intrinsically or by teacher attention) • Responsiveness to teacher praise if given in private (for students with emotional and behavioral disorders) • Little or no appreciation of praise from or social interactions with others (for some students with autism)	Explicitly and concretely describe desired behaviors. Reinforce desired behaviors using teacher attention, private praise, activity reinforcers, and group contingencies (for students with emotional and behavioral disorders). Reinforce accomplishments immediately, using concrete reinforcers or activity reinforcers; combine them with praise so that praise eventually becomes reinforcing in and of itself (for students with severe forms of autism). Shape desired behaviors over time; expect gradual improvement rather than immediate perfection. Punish inappropriate behaviors (e.g., using time-out or response cost); implement positive behavioral interventions and supports for persistently challenging behaviors.
Students with general delays in cognitive and social functioning	• Appreciation of and responsiveness to extrinsic reinforcers • Difficulty delaying gratification; behavior more likely to improve when reinforcement is immediate rather than delayed • Inappropriate responses in social situations • Difficulty generalizing desired behaviors from one situation to another	Explicitly teach and cue appropriate behaviors, but with the goal of having students eventually engage in such behaviors without prompts. Shape complex behaviors slowly over time; expect gradual improvement rather than immediate perfection. Reprimand minor misbehaviors; use time-out or response cost for more serious and chronic misbehaviors. Promote generalization of new responses (e.g., by teaching skills in real-world contexts and by reinforcing generalization).
Students with physical or sensory challenges	• Loss of some previously learned behaviors if students have had traumatic brain injury	Shape desired behaviors slowly over time; expect gradual improvement rather than immediate perfection.
Students with advanced cognitive development	• Unusual and sometimes creative responses to classroom tasks	Encourage and reinforce creative responses.

SOURCES: Barbetta, 1990; Beirne-Smith et al., 2006; Cooper et al., 2007; Cuskelly et al., 2003; Ellis & Friend, 1991; Goldstein & Rider, 2006; Hausman et al., 2014; Heward, 2009; Hobson, 2004; Leaf et al., 2016; Mercer & Pullen, 2005; Mueller et al., 2011; Neef et al., 2005; Pfiffner et al., 2006; Piirto, 1999; Turnbull et al., 2016.

◀ Throughout the book, the "Students in Inclusive Settings" boxes remind readers that the application of principles covered in each chapter must be carefully and critically considered with regard to the specific needs of students with special educational needs.



Applying Brain Research

Understanding and Addressing Adolescent Risk Taking

The brain continues to mature in important ways throughout adolescence and early adulthood. With puberty come significant changes in brain regions that play a role in pleasure-seeking, potentially heightening the desire for enjoyable activities and immediate rewards. Only later, perhaps in the late teens or early 20s, do regions of the prefrontal cortex that support rational decision making and self-restraint fully mature (Qu et al., 2015; Reyna et al., 2012; Somerville et al., 2010; Steinberg, 2009). Furthermore, young people show significant individual differences in brain activity levels in these important regions—differences that are correlated with their predisposition to seek out exciting but potentially dangerous activities on the one hand, or to be cautious and prudent on the other (Gianotti et al., 2009; Hollenstein & Lougheed, 2013; Joseph et al., 2009).

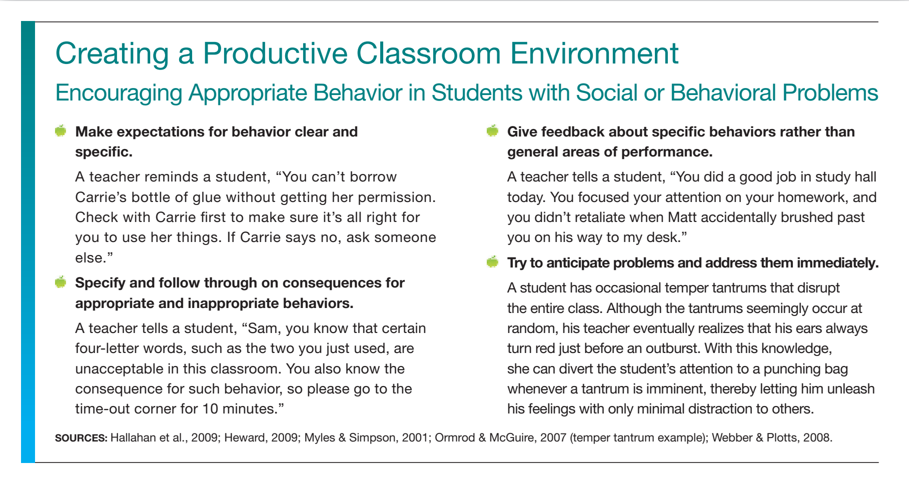
For such reasons, many adolescents have trouble planning ahead and controlling their impulses (Shulman et al., 2016; Spear, 2007; Steinberg et al., 2009). Moreover, they tend to make choices based on emotions ("This will be fun") rather than on logic ("There's a high probability of a bad outcome") (Casey & Caudle, 2013; Luna et al., 2013; Reyna et al., 2012). In addition, viewing images of risky behaviors on social media may increase the likelihood of an adolescent engaging in a subsequent risky behavior (Sherman et al., 2018). Thus, adolescent risk taking is most common in social contexts, where having fun is typically a high priority and it's easy to get swept away by what peers are doing or suggesting.

With such research findings in mind, we offer two recommendations.

- Channel adolescents' risk-taking tendencies into safe activities. Many adolescents enjoy trying things that are new, different, and perhaps a bit risky; such activities are reasonable if appropriate safeguards are in place. Team sports provide one outlet for both risk taking and social companionship. Preplanned, organized activities during traditionally high-risk periods are also beneficial; for example, many high schools offer all-night after-prom parties to keep students sober and safe when they might otherwise be drinking and driving.
- Provide avenues through which students can safely and productively gain status with their peers. Sometimes adolescents engage in risky behaviors—such as drinking, drug use, and sexual intercourse—in an attempt to project an adult-like image or to be "cool" (Allen & Antonishak, 2008; Blanton & Burkley, 2008; Crosnoe, 2011). There are much healthier ways to show one's social status, some of which we can support at school. Gaining competence and prominence in various arts activities, student government, and community service are just a few of the many possibilities.

◀ Although this book does not emphasize neuroscience, applying brain research features are included throughout the book to provide gentle introductions to some of the neuroscience that under girds the topics.

▶ The Creating a Productive Learning Environment Features provide readers with practices that can be utilized in classrooms. These strategies, which are based on research reviewed within the chapters in which they appear, help teachers to create classrooms in which all students can learn and be highly engaged.



Creating a Productive Classroom Environment

Encouraging Appropriate Behavior in Students with Social or Behavioral Problems

- **Make expectations for behavior clear and specific.**

  A teacher reminds a student, "You can't borrow Carrie's bottle of glue without getting her permission. Check with Carrie first to make sure it's all right for you to use her things. If Carrie says no, ask someone else."
- **Specify and follow through on consequences for appropriate and inappropriate behaviors.**

  A teacher tells a student, "Sam, you know that certain four-letter words, such as the two you just used, are unacceptable in this classroom. You also know the consequence for such behavior, so please go to the time-out corner for 10 minutes."
- **Give feedback about specific behaviors rather than general areas of performance.**

  A teacher tells a student, "You did a good job in study hall today. You focused your attention on your homework, and you didn't retaliate when Matt accidentally brushed past you on his way to my desk."
- **Try to anticipate problems and address them immediately.**

  A student has occasional temper tantrums that disrupt the entire class. Although the tantrums seemingly occur at random, his teacher eventually realizes that his ears always turn red just before an outburst. With this knowledge, she can divert the student's attention to a punching bag whenever a tantrum is imminent, thereby letting him unleash his feelings with only minimal distraction to others.

SOURCES: Hallahan et al., 2009; Heward, 2009; Myles & Simpson, 2001; Ormrod & McGuire, 2007 (temper tantrum example); Webber & Plotts, 2008.

Learning Management System (LMS)-Compatible Assessment Bank, and Other Instructor Resources

- Video Observation and Analysis Exercises These exercises are designed to help build skills in observing and analyzing teaching. Questions are based on videos found in the Pearson eTextbook, and ask teacher candidates to use a rubric and time-stamped comments to connect their observations to the concepts they have learned in the course.

LMS-Compatible Assessment Bank With this new edition, all assessment types—quizzes, application exercises, and chapter tests— are included in LMS-compatible banks for the following learning management systems: Blackboard, Canvas, D2L, and Moodle. These packaged files allow maximum flexibility to instructors when it comes to importing, assigning, and grading. Assessment types include:

- **Learning Objective Quizzes** Each chapter learning objective is the focus of a Learning Objective Quiz that is available for instructors to assign through their Learning Management System. Learning objectives identify chapter content that is most important for learners and serve as the organizational framework for each chapter. The higher-order, multiple-choice questions in each quiz will measure your understanding of chapter content, guide the expectations for your learning, and inform the accountability and the applications of your new knowledge. Each multiple-choice question includes feedback for the correct answer and for each distractor to help guide students' learning.
- **Application Exercises** Each chapter provides opportunities to apply what you have learned through Application Exercises.

  A model response written by experts is provided to help guide learning.
- **Chapter Tests** Suggested test items are provided for each chapter and include questions in multiple-choice and short-answer/essay formats.
- **Licensure Exam Practice** Every chapter ends with an exercise that gives learners an opportunity to answer multiple-choice and constructed-response questions similar to those that appear on many teacher licensure tests.

Instructor's Manual The Instructor's Manual is provided as a Word document and includes resources to assist professors in planning their course. These resources consist of chapter overviews, learning objectives, guidance for using available PowerPoint® slides to promote concept development, questions for discussion, supplemental teaching suggestions, and worksheets.

PowerPoint® Slides PowerPoint® slides are provided for each chapter and highlight key concepts and summarize the content of the text to make it more meaningful for students. Often, these slides also include questions and problems designed to stimulate discussion and to encourage students to elaborate and deepen their understanding of chapter topics.

Note: All instructor resources—LMS-compatible assessment bank, instructor's manual, and PowerPoint slides—are available for download at www.pearsonhighered.com. Use one of the following methods:

- From the main page, use the search function to look up the lead author (i.e., Anderman), or the title (i.e., *Educational Psychology: Developing Learners*). Select the desired search result, then access the "Resources" tab to view and download all available resources.
- From the main page, use the search function to look up the ISBN (provided above) of the specific instructor resource you would like to download. When the product page loads, access the "Downloadable Resources" tab.

Case Studies: Applying Educational Psychology (2nd ed.)

Many instructors use Ormrod and McGuire's *Case Studies* book as a supplement to this book. It includes 48 real cases involving students and classrooms ranging from preschool to high school. It illustrates concepts and principles in many areas of educational psychology, including child and adolescent development, learning and cognition, motivation, classroom management, instructional practices, and assessment.

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We've been fortunate to have had a great deal of help in writing this book. Kevin Davis began working with Jeanne on the first version of this book in 1989, and he continued to work on this book throughout the tenth edition. Kevin also brought Eric and Lynley on board starting with the ninth edition. The book wouldn't be what it is today without Kevin's guidance and encouragement. Kevin always pushed us to be innovative, and constantly reminded us to focus on applications of research that could be readily applied to practice in today's classrooms.

It has been a pleasure to now partner with Brooke Nethers on this new edition. Brooke has guided us through revisions and updates, encouraging us to be creative and to reorganize sections of the book as described above. Brooke has pushed us to rethink some of the content in the book, encouraging us in particular to both integrate new content (e.g., socioemotional learning) and to maintain our primary focus on providing teachers with evidence-based strategies and practices to promote student learning and engagement.

We are also indebted to developmental editor Curtis Vickers who has kept us on course. Curtis provided feedback on our content, style, and content coverage, gently reminding us of both how to make the book appealing to readers and useful to prospective educators. We also are indebted to Steve Kucinski, who updated the video examples, learning objective quizzes, and application exercises for this edition.

In addition, numerous colleagues across the nation have strengthened the book itself by reviewing one or more of its previous versions. Reviewers for the previous editions were Jane Abraham, Virginia Tech University; Joyce Alexander, Indiana University; Eric M. Anderman, then at University of Kentucky; Linda M. Anderson, Michigan State University; Margaret D. Anderson, SUNY–Cortland; Cindy Ballantyne, Northern Arizona University; J. C. Barton, Tennessee Technical University; Timothy A. Bender, Southwest Missouri State University; Stephen L. Benton, Kansas State University; Karen L. Block, University of Pittsburgh; Kathryn J. Biacindo, California State University–Fresno; Barbara Bishop, Eastern New Mexico University; Angela Bloomquist, California University of Pennsylvania; Phyllis Blumenfeld, University of Michigan; Gregory Braswell, Illinois State University; Robert Braswell, Winthrop College; Kathy Brown, University of Central Oklahoma; Randy L. Brown, University of Central Oklahoma; Kay S. Bull, Oklahoma State University; E. Namisi Chilungu, Georgia State University; Margaret W. Cohen, University of Missouri–St. Louis; Theodore Coladarci, University of Maine; Sharon Cordell, Roane State Community College; Roberta Corrigan, University of Wisconsin–Milwaukee; Richard D. Craig, Towson State University; Karen Cross, University of North Carolina–Charlotte; José Cruz, Jr., The Ohio State University; David Yun Dai, SUNY–University at Albany; Darlene DeMarie, University of South Florida; Peggy Dettmer, Kansas State University; Joan Dixon, Gonzaga University; Leland K. Doebler, University of Montevallo; Kellah Edens, University of South Carolina; Catherine Emilhovich, SUNY–Buffalo; Joanne B. Engel, Oregon State University; Kathy Farber, Bowling Green State University; William R. Fisk, Clemson University; Victoria Fleming, Miami University of Ohio; M. Arthur Garmon, Western Michigan University; Roberta J. Garza, Pan American University–Brownsville; Mary Gauvain, University of California–Riverside; Sister Nancy Gilchriest, St. Joseph's College; Nathan Gonyea, SUNY–Oneonta; Cheryl Greenberg, University of North Carolina–Greensboro; Richard Hamilton, University of Houston; Jennifer Mistretta Hampston, Youngstown State University; Ken Hay, Indiana University; Arthur Hernandez, University of Texas–San Antonio; Lynley Hicks, University of Missouri-Kansas City; Heather Higgins, University of North Carolina–Greensboro; Frederick C. Howe, Buffalo State College; Peggy Hsieh, University of Texas–San Antonio; Dinah Jackson, University of Northern Colorado; Janina M. Jolley, Clarion University of Pennsylvania; Caroline Kaczala, Cleveland State University; CarolAnne M. Kardash, University of Missouri–Columbia; Pamela

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Chapter 1

Teaching and Educational Psychology

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Learning Objectives

1.1 Reflect on and evaluate some of your existing knowledge and beliefs about human learning and effective instructional practices.

1.2 Use effective strategies when you read and study.

1.3 Develop a long-term plan for gaining expertise as a teacher.

1.4 Draw appropriate conclusions from various kinds of research studies.

1.5 Describe several strategies for collecting information about your own students.

CASE STUDY

The "No D" Policy

Anne Smith is a ninth-grade English teacher with 10 years of teaching experience, and by all accounts, she's an excellent teacher. Even so, in past years many of her students haven't invested much time or energy in their writing assignments and haven't appeared to be bothered by the low grades they've earned in her classes. In an effort to more fully engage this year's students in their schoolwork, Ms. Smith begins fall semester by initiating two new policies. First, to pass her course, students must earn at least a C; she won't give anyone a final grade of D. Second, students will have multiple opportunities to revise and resubmit assignments; she'll provide whatever feedback students need—and, if necessary, also provide one-on-one instruction—to help them improve their work. She solicits students' questions and concerns about the new policies, gains their agreement to "try something new," and engages them in a discussion of specific, concrete characteristics of A-quality, B-quality, and C-quality work. Then, as the semester progresses, she regularly administers brief surveys to get students' feedback about her innovations, asking such questions as "How is the 'no D' working for you?" "Do you think your grade is an accurate reflection of your learning?" and "Any suggestions?"

Students' responses on the surveys are overwhelmingly positive. Students mention noticeable improvements in the quality of their writing and increasingly report that they believe themselves to be in control of both their learning and their grades. Furthermore, they begin to see their teacher in a new light—"as one who will help them achieve their best work, not as one who just gives out grades . . . as a coach encouraging them along the long race of learning." Final course grades also confirm the value of the new policies: A much higher percentage of students earn grades of C or better than has been true in past years. (Action research project described in Smith, 2009.)

- Effective teachers don't simply transmit new information and skills to students; they also work hard to help students *master* the information and skills. In the case study just presented, what various strategies does Ms. Smith use to foster her students' writing development?

Teaching other people—especially teaching the generation that will follow you into the adult world—can be one of the most rewarding professions on the planet. It can also be a very challenging profession. Certainly, effective teaching involves presenting a topic or skill in such a way that students can understand and eventually master it. Yet it involves many other things as well. For instance, teachers must motivate students to *want* to learn the subject matter, must help students recognize what genuine learning actually involves, and—in order to individualize instruction appropriately—must assess each student's progress in learning. Effective teachers create an environment in which students believe that if they work hard and have reasonable support, they can achieve at high levels. In the opening case study, Anne Smith does all of these things.

For teachers, mastering the multifaceted nature of teaching takes time and practice, of course. But it also takes considerable knowledge about human learning and motivation, developmental trends, individual and group differences, and effective instructional practices. Such topics are the domain of **educational psychology**. This book will help you understand children and adolescents—how they learn and develop, how they're likely to be similar to but also different from one another, and what topics and activities are likely to engage them in the classroom. It will also give you a toolbox of strategies for planning and carrying out instruction, creating an environment that keeps students motivated and on task, and assessing students' progress and achievement.

Reflecting on What You Already Know About Learning and Instruction

Learning Objective 1.1 Reflect on and evaluate some of your existing knowledge and beliefs about human learning and effective instructional practices.

You yourself have been a student for many years now, and in the process you've undoubtedly learned a great deal about how children change over time and about how teachers can foster their learning and development. But exactly how much *do* you know? To help you find out, we authors offer a short pretest, Ormrod's Own Psychological Survey (OOPS).

Experiencing Firsthand

Ormrod's Own Psychological Survey (OOPS)

Decide whether each of the following statements is *true* or *false.*

True	False	1.	Some children are predominantly left-brain thinkers, whereas others are predominantly right-brain thinkers.
True	False	2.	Children's personalities are largely the results of their home environments.
True	False	3.	Instruction is most effective when it is tailored to students' individual learning styles.
True	False	4.	The best way to learn and remember a new fact is to repeat it over and over.
True	False	5.	Students often misjudge how much they know about a topic.
True	False	6.	Anxiety sometimes helps students learn and perform more successfully in the classroom.
True	False	7.	Playing video games can enhance children's cognitive development and school achievement.
True	False	8.	The ways in which teachers assess students' learning influence what and how students actually learn.

Following are the correct answers to each item, along with an explanation regarding *why* it is true or false.

1. *Some children are predominantly left-brain thinkers, whereas others are predominantly right-brain thinkers.* FALSE. With the development of new medical technologies in recent years, researchers have learned a great deal about how the human brain works and which parts of it specialize in which aspects of thinking. The two halves, or *hemispheres,* of the brain do seem to have somewhat different specialties, but they continually communicate and collaborate in tackling even the simplest of daily tasks. For all intents and purposes, there's no such thing as left-brain or right-brain thinking (Bressler, 2002; Posner & Rothbart, 2007; Siegel, 2012).

The brain's structure, functioning, and development are discussed in Chapter 2 and in Applying Brain Research features throughout the book.

2. *Children's personalities are largely the results of their home environments.* FALSE. Certainly children's home environments affect their behaviors to some extent. But other people outside the family, including teachers, have considerable influence on children's typical ways of behaving (e.g., Morelli & Rothbaum, 2007). Furthermore, inherited characteristics have a significant impact on children's personalities. From day 1, infants are noticeably different in the extent to which they're calm or fussy, shy or outgoing, fearful or adventurous, and attentive or easily distractible. Such differences in *temperament* appear to have their roots in biology and genetics, and

Chapter 3 discusses temperament and personality development.

they persist throughout the childhood years and into adulthood (Kagan & Snidman, 2007; Keogh, 2003; Rothbart, 2011).

Chapter 5 describes individual differences in cognitive abilities and dispositions that can significantly affect students' learning and academic achievement. Chapter 7 describes general mental processes that underlie effective thinking, learning, and memory.

3. *Instruction is most effective when it is tailored to students' individual learning styles.* FALSE. Contrary to a popular belief, most measures of supposed "learning styles" merely reflect students' self-reported *preferences*, and tailoring instruction to such preferences doesn't noticeably enhance students' learning or academic achievement (Kirschner & van Merriënboer, 2013; Pashler et al., 2008; Rogowsky et al., 2015). It is far more important that teachers base their instructional practices on knowledge of the cognitive processes that underlie how virtually *all* students think and learn.
4. *The best way to learn and remember a new fact is to repeat it over and over.* FALSE. Although repeating information several times is better than doing nothing at all, repetition of specific facts is a relatively *in*effective way to learn. Students learn information more easily and remember it longer when they connect it with things they already know. One especially effective strategy is **elaboration**: using prior knowledge to expand or embellish on a new idea in some way, perhaps by drawing inferences from certain historical facts, identifying new examples of a scientific concept, or thinking of situations in which a mathematical procedure might be helpful (Anderson, 2005; Graesser & Bower, 1990; McNamara & Magliano, 2009).

Chapter 7 discusses elaboration and its implications for instructional practice.

5. *Students often misjudge how much they know about a topic.* TRUE. Most adults and children are *not* the best judges of what they do and don't know. For example, many students think that if they spend a long time studying a textbook chapter, they will learn its contents very well. Yet if they've spent most of their time studying ineffectively—perhaps by "reading" while thinking about something else altogether or by mindlessly copying definitions—they may know far less than they think they do (Stone, 2000; Thiede et al., 2009).

Chapter 8 describes this *illusion of knowing* in more detail.

6. *Anxiety sometimes helps students learn and perform more successfully in the classroom.* TRUE. Many people think that anxiety is always a bad thing. In fact, a *little bit* of anxiety can actually *improve* learning and performance, especially when students perceive a task to be something they can accomplish with reasonable effort. For instance, a small, manageable amount of anxiety can spur students to complete their work carefully and to study for tests (Cassady, 2010; Perry et al., 2006; Siegel, 2012).

Chapter 11 explores anxiety's effects in different situations.

7. *Playing video games can enhance children's cognitive development.* TRUE—or more accurately, SOMETIMES TRUE. A great deal of time spent playing video games *instead of* reading, doing homework, and engaging in other school-related activities can definitely interfere with students' long-term academic success. But some video games can be powerful tools for promoting important cognitive abilities. For example, especially within the past two decades, some educational technologists have designed highly motivating video games that simulate real-world problems and foster complex problem-solving skills (Clark et al., 2016; Granic et al., 2014; Plass et al., 2015).

Chapter 8 explores potential benefits of appropriately designed video games.

8. *The ways in which teachers assess students' learning influence what and how students actually learn.* TRUE. We see this principle in action in the opening case study: Anne Smith's "No D" and multiple-submission policies convey the message that students can't get by with only marginal work, so students are more likely to seek feedback about their work, benefit from their mistakes, and enhance their writing skills. *Good* assessments encourage cognitive processes essential for high-quality learning. For example, students are more likely to pull class material into an integrated, meaningful whole if they expect **assessment** activities to require such synthesis, and they're more likely to focus on applying what they learn to new situations if they think that assessments will involve application tasks (Carpenter, 2012; Pan et al., 2016; Schraw & Robinson, 2011).

Chapter 14 and Chapter 15 describe various ways in which assessment practices affect students' learning.

How many of the OOPS items did you answer correctly? Did some of the false items seem convincing enough that you marked them true? Did one or more of the true items contradict certain beliefs you had? If either of these was the case, you're hardly alone. Many of us often agree with statements that seem to be obviously "true," but are, in fact, partially or completely incorrect (Gage, 1991; Goldstein & Lake, 2000; Woolfolk Hoy et al., 2006).

It's easy to be persuaded by "common sense" and to assume that what seems logical must be true. Yet common sense and logic don't always give us the real scoop about how people actually learn and develop, nor do they always give us appropriate guidance about how best to help students succeed in classrooms. Thus, much of our knowledge about learning and instruction must come from credible and consistently replicated research findings and from the general principles and theories that those findings support.

Studying and Learning Effectively

Learning Objective 1.2 **Use effective strategies when you read and study.**

As you learn more about educational psychology—and especially as you learn about the nature of human thinking and learning—you'll gain many insights into how you can help students more effectively master classroom subject matter. We authors hope that you'll also gain insights into how *you yourself* can better learn and remember course material. For now, we suggest six general strategies.

You'll learn much more about effective learning and study strategies in upcoming chapters, especially in Chapter 7 and Chapter 8.

- *Set one or more goals for yourself as you read and study*. Whenever you begin a study session, decide what you want to accomplish during that session, and *be specific*. For example, decide how much new material you want to read, how much and in what ways you might review and practice content you've previously learned, or both. The Learning Objectives you'll see at the beginning of each chapter and at relevant points later in the chapter can give you some guidance about appropriate goals.
- *Relate what you read to your existing knowledge and prior experiences*. For example, connect new concepts and principles with memorable childhood events, previous course work, or your general knowledge about human beings and their behavior. In general, people learn and remember things more easily and effectively when they engage in **meaningful learning**—that is, when they connect new information and ideas to what they've previously learned.
- *Elaborate on what you read, going beyond it and adding to it*. Earlier in the chapter we mentioned that the process of *elaboration*—embellishing on new information in some way—enhances learning and memory of the information. So try to think *beyond* the information you read. Draw inferences from the ideas presented. Generate new examples of concepts. Identify your own educational applications of various principles of learning, development, and motivation.
- *Actively consider how some new information might contradict your existing beliefs*. As the preceding OOPS test may have shown you, some of what you currently "know" and believe about learning and instruction may be sort-of-but-not-quite accurate or even entirely *in*accurate. People's existing beliefs can occasionally wreak havoc with new learning. For example, many students in teacher education classes reject research findings that appear to be inconsistent with their personal beliefs and experiences (Fives & Gill, 2015; Gregoire, 2003; Richardson, 2003).

  As you read about and study educational psychology, then, think about how some ideas and research findings might actually contradict and discredit your prior

Chapter 7 explores meaningful learning and conceptual change in greater depth.

"knowledge." When you encounter puzzling or seemingly "wrong" ideas and findings, we hope you'll keep an open mind and, in particular, consider how and why they might have some validity and worth. Ideally, effective learners undergo **conceptual change**: They revise their existing notions to accommodate new and discrepant information.

Chapter 2 discusses the development of abstract thinking and other significant cognitive advancements during the school years.

- *Tie abstract concepts and principles to concrete examples*. Children become increasingly able to think about abstract ideas as they get older, but people of *all* ages can more readily understand and remember abstract information when they connect it to concrete objects and events. Short examples and lengthier case studies that involve real students and teachers, videos that depict classrooms in action, Experiencing Firsthand exercises such as the OOPS test—all of these can enhance your understanding and memory of new concepts and help you recognize them when you see them in your own work with children and adolescents.
- *Periodically check yourself to make sure you remember and understand what you have read.* There are times when even the most diligent students don't concentrate on what they're reading—when they're actually thinking about something else as their eyes go down the page. So stop once in a while (perhaps once every two or three pages) to make sure you've really learned and understood the things you've been reading. Try to summarize the material. Ask yourself questions about it, and make sure everything makes sense to you. And tackle the Practice for Your Licensure Exam exercise that appears after each chapter summary.

When all is said and done, your overall goal in studying educational psychology shouldn't be to memorize enough facts that you can get good grades on tests and quizzes. Instead, your goal should be to become the best teacher—and also the best *learner*—you can possibly be. As you look forward to your entry into the teaching profession, we urge you to be confident that with time, practice, a solid understanding of how children and adolescents learn and develop, a large toolkit of instructional strategies, and every student's best interests at heart, you can truly make a difference in young people's lives.

Developing as a Teacher

Learning Objective 1.3 Develop a long-term plan for gaining expertise as a teacher.

In your first year as a novice teacher, you may initially find your role a bit overwhelming. Virtually any classroom will be one of nonstop action requiring you to be continually attentive and on your toes, and there will always be a great deal to think about.

If you are currently enrolled in a teacher education program, you should think of your program as a very good start on the road to becoming a skillful teacher (Bransford et al., 2005a; Brouwer & Korthagen, 2005). However, it's *only* a start. Developing true expertise in any profession, including teaching, takes many years of experience, although even a single year of teaching experience can make a significant difference (Berliner, 2001; Clotfelter et al., 2007; Henry et al., 2011). Please be patient with yourself, and recognize that occasionally feeling a bit unsure and making mistakes is par for the course. As you gain experience, you'll gradually become able to make decisions about routine situations and problems quickly and efficiently, which will you the time and energy to think creatively and flexibly about how best to teach classroom subject matter (Borko & Putnam, 1996; Bransford et al., 2005b; Feldon, 2007).

We can offer you several good strategies for enhancing your teaching expertise—all of them based on research on teacher effectiveness. It's important to note here that most public and private schools *require* teachers to document their ongoing professional growth through such strategies.

- *Keep up to date on research findings and innovations in education.* Additional university coursework and in-service training sessions at your school are two good ways to increase your teaching effectiveness (Desimone, 2009; Hattie, 2009; McDonald et al., 2011). In addition, effective teachers typically subscribe to one or more professional journals, and as time allows, they occasionally attend professional conferences in their area.
- *Learn as much as you can about the subject matter you teach.* When we look at effective teachers—for example, those who are flexible in their approaches to instruction, help students acquire a thorough understanding of classroom topics, and convey obvious enthusiasm for whatever they're teaching—we typically find teachers who know their subject matter extremely well (Borko & Putnam, 1996; Cochran & Jones, 1998; Hill et al., 2008).
- *Learn as much as you can about specific strategies for teaching your particular subject matter.* In addition to knowing general teaching strategies, it's helpful to acquire strategies specific to the topic you're teaching—strategies that are collectively known as **pedagogical content knowledge**. Effective teachers typically have a large number of strategies for teaching particular topics and skills. Furthermore, they can usually anticipate—and so can also address—the difficulties students will have and the kinds of errors students will make in the process of mastering a skill or body of knowledge (Baumert et al., 2010; Krauss et al., 2008; Sadler et al., 2013; Shulman, 1986).
- *Learn as much as you can about the culture(s) of the community in which you are working.* Students are more likely to do well academically when the school curriculum and classroom environment take their cultural backgrounds into account (Brayboy & Searle, 2007; Moje & Hinchman, 2004; Tyler et al., 2008). Reading about various cultures can certainly be helpful. But ideally, you can best inform yourself about students' cultural beliefs and practices if you participate in local community activities and converse regularly with community members (Castagno & Brayboy, 2008; McIntyre, 2010).

  At the same time, we urge you *not* to form rigid stereotypes about members of any particular cultural group—or about *any* group of students, for that matter. Yes, it's occasionally helpful to consider **between-group differences**—ways in which members of various cultural groups, economic groups, or genders are apt to be a bit different *on average* with respect to certain characteristics or behaviors. However, you should typically be more aware of **within-group differences**—the many ways in which the individual members of any particular group exhibit characteristics and behaviors unique to themselves.

You can find discussions of between-group differences in many chapters of this book, and especially in Chapter 4. You will find an in-depth discussion of within-group differences—also known as *individual differences*—in Chapter 5.

- *Continually reflect on and critically examine your assumptions, inferences, and teaching practices.* In the opening case study, Anne Smith reflects on her students' performance in previous years and then institutes new assessment policies that she thinks might be more motivating and productive. Like Ms. Smith, effective teachers engage in **reflective teaching**: They continually examine and critique their assumptions, inferences, and instructional practices, and they regularly adjust their beliefs and strategies in the face of new evidence (Hammerness et al., 2005; Hogan et al., 2003; Larrivee, 2006).
- *Communicate and collaborate with colleagues.* Effective teachers rarely work in isolation. Instead, they frequently communicate with colleagues in their own school district, across the nation, and, often, in other countries. Furthermore, they regularly coordinate their efforts to enhance students' learning and personal well-being at a schoolwide level (Bransford et al., 2005b; Raudenbush, 2009; Ronfeldt et al., 2015).

Teacher lounges, email, group text messages, blogs, and video communication software (e.g., Zoom) —all of these provide vehicles for cross-communication and can potentially offer ideas for lesson plans and instructional activities on a wide range of topics. For example, you might look at Smithsonian Education (smithsonianeducation.org), Khan Academy (khanacademy.org), or Open Educational Resources (oercommons.org). You should also look at the websites of professional organizations related to your field; the websites for the National Council of Teachers of Mathematics (nctm.org), the National Council for the Social Studies (socialstudies.org), and the American Council on the Teaching of Foreign Languages (actfl.org) are just three of the many possibilities.

Keep in mind, too, that even the most masterful teachers had to begin their teaching careers as novices, and they probably entered their first classroom with the same concerns and uncertainties you may initially have. Most experienced teachers are happy to offer you advice and support during challenging times; in fact, they're apt to be flattered that you're asking them! Ideally, teachers and administrators at a single school create a **professional learning community**, in which they share a common vision for students' learning and achievement, work collaboratively to achieve desired outcomes for all students, and regularly communicate with one another about their strategies and progress (Doğan & Adams, 2018; DuFour et al., 2008; Graham & Ferriter, 2009; Raudenbush, 2009).

- *Believe that you can make a difference in students' lives.* In general, human beings achieve at higher levels in their endeavors when they have high **self-efficacy**—that is, when they believe that they're capable of executing certain behaviors or reaching certain goals. Students are more likely to try to learn something if they believe they *can* learn it—in other words, if they have high self-efficacy. But as a teacher, you, too, must have high self-efficacy. Believing that you can be a good teacher will give you confidence to try new strategies and help you persist in the face of occasional setbacks. Students who achieve at high levels are apt to be those whose teachers have confidence that, *as teachers*, they can make a significant difference as they work both individually in their classrooms and collectively with their colleagues (Holzberger et al., 2013; Skaalvik & Skaalvik, 2008; Zee & Koomen, 2016). Ultimately, what teachers do in the classroom *matters* for students, not only in the short term but for years to come (Hattie, 2009; Konstantopoulos & Chung, 2011).

You can learn more about the nature and effects of self-efficacy in Chapter 10.

Understanding and Interpreting Research Findings

Learning Objective 1.4 **Draw appropriate conclusions from various kinds of research studies.**

As professionals, teachers are *decision makers* who must choose among many, many possible strategies for helping students learn. Certainly, teaching is an art to some degree: Good teachers are creative and innovative, and they add many imaginative touches to enhance lessons and activities. But that art must be based on a firm foundation of research findings both about how human beings learn and about how teachers can help them learn effectively; in other words, it must be based on the *science of learning* and the *science of instruction.* Good teaching involves **evidence-based practices**—the use of instructional methods and other classroom strategies that research has consistently shown to bring about significant gains in students' development and academic achievement.

Many research studies involve **quantitative research**: They yield *numbers* that reflect percentages, frequencies, or averages related to certain characteristics or phenomena.

For example, a quantitative study might provide information about students' scores on achievement tests, students' responses to rating-scale questionnaires, or school district records of students' attendance and dropout rates.

Other studies involve **qualitative research**: They yield *nonnumeric data*—perhaps in the form of verbal reports, written documents, pictures, videos, or maps—that capture many aspects of a complex situation. For example, a qualitative study might involve one-on-one interviews in which students describe their hopes for the future, a detailed case study of interpersonal relationships within a tight-knit clique of adolescent girls, or in-depth observations of several teachers who create distinctly different psychological atmospheres in their classrooms.

The research study described at the beginning of the chapter is partly a quantitative one: Anne Smith tabulates students' responses to various survey questions and computes the percentages of various final class grades. But when she collects the completed surveys, she also looks closely at students' specific comments and suggestions—qualitative information. Research that involves both quantitative and qualitative data is often referred to as **mixed-methods research**.

Not all research on learning and instruction is *good* research, of course. Furthermore, people sometimes draw inappropriate conclusions from even the best of research studies. It's important, therefore, that teachers understand what various kinds of research studies can and cannot tell us about learning and instruction.

Quantitative Research

Quantitative research studies vary widely in nature, but you might think of them as falling into four general categories: descriptive, correlational, experimental, and quasi-experimental. These categories yield different kinds of information and warrant different kinds of conclusions. These categories are described briefly below, and in greater depth in Appendix A.

Descriptive Studies A **descriptive study** does exactly what its name implies: It *describes* a situation. Descriptive studies provide information about students. But they also can provide us with descriptive information about teachers, schools, or even districts and larger contexts such as neighborhoods. Descriptive studies enable us to draw conclusions about the way things are at the time when data are collected.

Correlational Studies A **correlational study** explores relationships between two or more variables. For example, if we have measures of students' math achievement and students' liking of math as a subject area, a correlational study can provide us with an estimate of the relationship between math achievement and liking math. Correlations between variables are often described with a statistic known as a *correlation coefficient*. When two variables are correlated such that when one increases the other also increases, there is a *positive correlation*. But when one tends to decrease as the other increases, we observe a *negative correlation*. And when there is basically no relationship between two variables, we observe a correlation close to zero. A limitation of correlational studies is that they don't tell us which specific factors—previous experiences, academic engagement, or perhaps other things we haven't thought of—are the cause of the relationships between variables. You probably have heard this well-known (and true!) saying: *correlation does not necessarily indicate causation.*

Experimental and Quasi-Experimental Studies In an **experimental study**, researchers manipulate one or more variables in order to examine the effects of such manipulations on other variables. For example, a researcher might divide students into two groups, with one group receiving math homework four times per week, and the other receiving homework only one night per week. The researcher might then compare the effects of having homework only once per week with having homework four times per week by examining both groups' performance on a math test.

Ideally in experimental studies, students are randomly assigned to the various conditions in the study (e.g., homework once per week or four times per week). But random assignment isn't always possible, particularly when doing research in schools. Thus, many education research studies are **quasi-experimental studies**, in which researchers take into account but don't completely control other influential factors. For example, if it isn't possible to randomly assign students to either receive one or four homework assignments per week, a researcher might select two classrooms in the same school, where the students in each class are as similar as possible (e.g., the same grade level, gender breakdown, receive the same math instruction, etc.). The students in one classroom might be assigned homework once per week, and the students in the other classroom would be assigned homework four times per week. If the researchers know that the students are receiving the same instruction (e.g., the teachers are using the same curriculum) and if the students are similar in other ways (e.g., age, etc.), then the researcher can compare their math scores and be reasonably sure that any differences in scores will be due to the differing homework frequency (but not as sure as they would be if an experiment with random assignment had been possible).

Qualitative Research

Rather than address questions related to quantity—questions regarding *how much, how many,* or *how often*—researchers sometimes want to look in depth at the nature of certain characteristics or behaviors. Imagine, for example, that a researcher wants to find out what kinds of study strategies high-achieving students tend to use. One approach would be simply to ask the students questions such as "What things do you do to help you remember what you read in your textbooks?" and "How do you prepare for tests in your classes?" Students' responses to such open-ended questions are apt to go in many different directions, sometimes focusing on various behaviors (e.g., taking notes, working on practice problems) and at other times focusing on various mental processes (e.g., trying to make sense of a passage, generating new examples of concepts). Although it might be possible to categorize students' responses and count those falling into each category (thereby obtaining some quantitative data), the researcher may also want to preserve the multifaceted qualities of students' responses by reporting word-for-word excerpts from the interviews.

Qualitative research is often used to explore the complex nature of human behavior in social settings—perhaps in particular social groups, classrooms, schools, or cultures. For example, in-depth qualitative studies have contributed in important ways to our knowledge of school characteristics that affect the academic and social success of students from diverse backgrounds (e.g., Hemmings, 2004; McIntyre, 2010; Ogbu, 2003).

Like descriptive quantitative studies, qualitative studies *describe* the current state of affairs; they're inappropriate for drawing hard-and-fast conclusions about correlation or cause–and–effect. The rightmost column of Table 1.1 presents examples of questions that might best be answered by qualitative research.

Mixed-Methods Research

You shouldn't think of quantitative and qualitative research as an either–or situation. Like Anne Smith in the opening case study, many educational researchers can best address their research questions by combining elements of both quantitative and qualitative research in what is known as a **mixed-methods study**. For example, in a study described in the *American Educational Research Journal* in 1999, researchers Melissa Roderick and Eric Camburn tracked more than 27,000 students' academic progress as they made the transition from small elementary or middle schools to larger high schools in the Chicago public schools. Many students showed a sharp decline in academic achievement in their first year of high school. More than 40% of first-semester ninth

COMPARE/CONTRAST

Table 1.1 Contrasting Various Types of Research

	QUANTITATIVE RESEARCH STUDIES			**Qualitative Research Studies (Descriptive)**
	Descriptive Studies	**Correlational Studies**	**Experimental and Quasi-Experimental Studies**	
General Nature and Purposes	• Capture the current state of affairs regarding a real-world issue or problem	• Identify associations among variables • Enable predictions about one variable, given knowledge of the degree or quantity of another variable • Provide an alternative when experimental studies are unethical or impossible	• Manipulate one variable in order to observe its possible effect on another variable • Eliminate other plausible explanations for observed outcomes (especially in carefully controlled experimental studies) • Enable conclusions about cause-and-effect relationships	• Portray the complex, multifaceted nature of human behavior, especially in real-world social settings
Limitations	• Don't enable either (a) predictions about one variable based on another variable or (b) conclusions about cause-and-effect relationships	• Enable only imprecise predictions, with many exceptions to the general relationships observed • Don't enable conclusions about cause-and-effect relationships	• May not completely eliminate alternative explanations for observed outcomes (especially with quasi-experimental studies) • In some cases, involve artificial laboratory conditions that don't resemble real-life learning environments	• Don't enable either predictions or conclusions about cause-and-effect relationships
Examples of Questions That Might Be Addressed	• How pervasive are gender stereotypes in popular children's literature? • How well have students performed on a recent national achievement test?	• Are better readers also better spellers? • Are students more likely to be aggressive at school if they often see violence at home or in their neighborhoods?	• Which of two reading programs produces greater gains in reading comprehension? • Do different kinds of tests (e.g., multiple-choice vs. essay tests) encourage students to study in different ways?	• What things do high-achieving students say they do "in their heads" when they read and study their textbooks? • In what ways do teachers' instructional practices change when their jobs and salaries depend on their students' scores on standardized achievement tests?

graders (males especially) failed at least one course, and students who achieved at low levels early in their high school career were more likely to drop out before graduation.

Such troubling findings are examples of quantitative data, but the researchers also obtained qualitative information that can help us understand the numbers. For instance, they described a student named Anna, who had done well in her neighborhood K–8 school and seemingly had the basic skills she needed to successfully tackle a high school curriculum. Unfortunately, Anna was overwhelmed by the new demands that her ninth-grade classes placed on her, and her first-semester final grades included several Ds and an F. In an interview with one of the researchers, she gave the following explanation:

> In geography, "he said the reason why I got a lower grade is 'cause I missed one assignment and I had to do a report, and I forgot that one." In English, "I got a C . . . 'cause we were supposed to keep a journal, and I keep on forgetting it 'cause I don't have a locker. Well I do, but my locker partner she lets her cousins use it, and I lost my two books there. . . . I would forget to buy a notebook, and then I would have them on separate pieces of paper, and I would lose them." And, in biology, "the reason I failed was because I lost my folder . . . it had everything I needed, and I had to do it again, and, by the time I had to turn in the new folder, I did, but he said it was too late." (Roderick & Camburn, 1999, p. 305)

In addition, the interview revealed Anna's perception of most school faculty members as being uncaring, inattentive to students' difficulties, and inflexible in evaluating achievement. If Anna's behaviors, experiences, and perceptions are common ones—and apparently they are—they point to the need for greater faculty support as students make the transition from a close-knit elementary or K–8 school to a more impersonal high school environment. This support might be not only emotional but also *academic*—for instance, it should probably include instruction and guidance in organizational skills and effective study habits. We must be careful in drawing such inferences, however. Remember, qualitative data are essentially *descriptive* data: They tell us *how things are* rather than *what causes what.* Any hypotheses about cause-and-effect relationships drawn from qualitative data are only that—hypotheses—that ideally should be tested with experimental studies.

Interpreting Research Results: A Cautionary Note

Whenever we look at the results of a study, we can determine that a particular condition or intervention has led to a particular outcome—that is, there is a cause-and-effect relationship between the two—only if we've eliminated all other possible explanations for the results we've observed. As an example, imagine that Hometown School District wants to find out which of two reading programs, *Reading Is Great* (RIG) or *Reading and You* (RAY), leads to better reading in third grade. The district asks each of its third-grade teachers to choose one of these two reading programs and use it throughout the school year. The district then compares the end-of-year achievement test scores of students in the RIG and RAY classrooms and finds that RIG students have substantially higher reading comprehension scores than RAY students. We might quickly jump to the conclusion that RIG promotes better reading comprehension than RAY—in other words, that a cause-and-effect relationship exists between the instructional method and reading comprehension. But is this really so?

Not necessarily. The fact is, the school district hasn't eliminated all other possible explanations for the difference in students' reading comprehension scores. Remember, the third-grade teachers personally *chose* the instructional program they used. Were the teachers who chose RIG different in some way from those who chose RAY? For instance, did the RIG teachers have higher expectations for their students, or did they devote more class time to reading? Or, perhaps, did the RIG teachers have students who were, on average, better readers to begin with? If the RIG and RAY classrooms were different from each other in any of these ways—or perhaps different in some other way we haven't thought of—then the district hasn't eliminated alternative explanations for why the RIG students have outperformed the RAY students. A better way to study the causal influence of a reading program on reading comprehension would be to *randomly assign* third-grade classes to the RIG and RAY programs, thereby making the two groups similar (on average) in terms of student abilities and teacher characteristics.

When reading descriptions of new research findings, remember that you and others can legitimately draw conclusions about cause-and-effect relationships only if other possible explanations for an outcome can be eliminated.

Whenever you read descriptions of research findings, be careful that you don't jump too quickly to conclusions about what factors are affecting students' learning, development, and behavior in particular situations. Scrutinize the reports carefully, always with these questions in mind: *Have the researchers separated and controlled variables that might have an influence on the outcome? Have they ruled out other possible explanations for their results?* Only when the answers to these questions are undeniably *yes* and *yes* should you draw a conclusion about a cause-and-effect relationship.

From Research to Practice: The Importance of Principles and Theories

Consistent patterns in research findings have led psychologists to make many generalizations about students' learning and development, along with many generalizations about instructional strategies that can effectively enhance students' achievement and well-being. Some of these generalizations take the form of **principles**, which identify certain factors that affect learning or development and describe the specific effects these factors have. For example, consider this principle:

> A behavior that is followed by a satisfying state of affairs—a reward—is more likely to occur again than a behavior not followed by a reward.

In this principle, a particular factor (a rewarding consequence) is identified as having a particular effect (an increase in the behavior's frequency). The principle can be observed in many situations; following are two examples:

- A student's interpersonal skills improve after we begin praising the student for interacting with peers respectfully and cooperatively. (Here, the reward is *praise.*)
- A student becomes more diligent in completing math assignments once we've begun to tailor assignments to the student's current ability level, such that the student more often achieves success in the assignments. (Here, the reward is a *success experience.*)

Principles are most useful when they can be applied to many different situations. The "reward" principle—many psychologists instead use the term *reinforcement*—is an example of such broad applicability: It holds true for many different types of learning and a wide variety of pleasant consequences.

Whereas principles tell us *what* factors are important for human learning and development, **theories** tell us *why* certain factors might be important. More specifically, theories provide possible explanations about the underlying mechanisms involved in learning or development. By giving us ideas about why we are consistently observing certain cause-and-effect relationships, theories can help us create learning environments that facilitate students' learning, development, and achievement to the greatest extent possible.

Let's consider an example. One prominent theory of how people learn—information-processing theory—proposes that attention is an essential ingredient in the learning process. More specifically, if a learner pays attention to new information, the information moves from one component of the human memory system (the sensory register) to another, longer-lasting component (working memory). If the learner *doesn't* pay attention, the information quickly disappears from the memory system; in the words of a common expression, the information "goes in one ear and out the other." The importance of attention in information-processing theory suggests that strategies that capture and maintain students' attention—perhaps assigning interesting reading materials or presenting intriguing real-world problems—are apt to enhance students' learning and achievement. It also alerts us to the fact that a concrete reward for learning something new might be detrimental (rather than helpful) if it subsequently *distracts* a student's attention from a learning activity.

Chapter 7 describes information-processing theory in depth.

You might think of principles as reflecting relatively enduring conclusions about cause-and-effect relationships related to people's learning and development. Principles tend to be fairly stable over time. In contrast, psychological theories are rarely, if ever, set in stone. Instead, they're continually expanded and modified as additional data come to light, and in some cases one theory may be abandoned in favor of another that better explains a particular phenomenon.

Although psychological theories will inevitably change in the future, they can be quite valuable even in their unfinished forms. They help us integrate thousands of research studies into concise understandings of human learning and development, and they enable us to draw inferences and make predictions about how students are likely to perform and achieve in particular classroom situations. In general, theories help us to both *explain* and *predict* human behavior, thereby giving us countless ideas about how best to promote students' academic and social success at school.

In this book, you'll encounter a variety of theories related to different aspects of human learning, and they don't always lead to the same conclusions about human beings' thinking and behavior. Yet, we authors firmly believe that each theory we introduce offers unique insights and thus has important things to say about students' classroom learning and performance. We hope that our readers will take an equally open-minded approach. It's probably most helpful to think of psychological theories in terms of their *usefulness* in classroom decision making, rather than in terms of their *this-is-the-ultimate-truth* completeness and accuracy.

Collecting Data and Drawing Conclusions About Your Own Students

Learning Objective 1.5 **Describe several strategies for collecting information about your own students.**

Certainly, the collection and interpretation of quantitative and qualitative data aren't restricted only to researchers who work in universities and laboratories. In fact, practicing teachers continually collect and interpret data about their own students through formal and informal assessments of students' written work and classroom behaviors. Furthermore, many teachers plan and conduct their own research to help them better understand their students and schools—a process known as *action research.*

Assessing Students' Achievements and Interpreting Their Classroom Behaviors

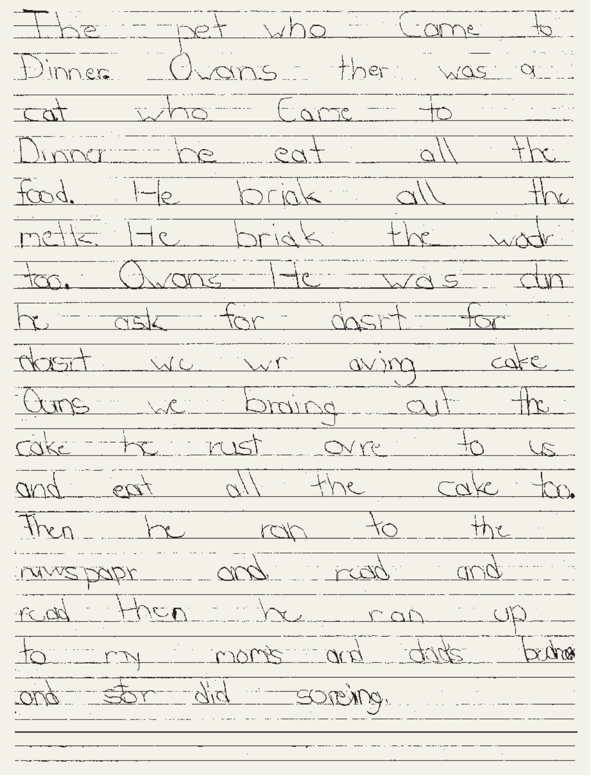
Most teachers regularly assess what their students know and can do, perhaps by examining students' performance in assignments, projects, presentations, and quizzes. But effective teachers don't limit themselves only to such formal, planned evaluations. They continually observe their students in a variety of contexts—not only in the classroom but also in the hallways and cafeteria, on the playground, at extracurricular events, in their online interactions, and during parent–teacher conferences—for clues about what students might be thinking, believing, feeling, and learning. Students' comments, questions, body language, work habits, and interactions with friends and classmates can provide valuable insights into their learning, development, and motivation.

You will learn much more about teacher assessment strategies in Chapter 14.

Use assessment results to form hypotheses—but *not* to draw hard-and-fast conclusions—about students' current characteristics and abilities and about effective instructional strategies.

To get your feet wet in the process of assessment, read 7-year-old Justin's short story, "The Pet Who Came to Dinner," presented in Figure 1.1. As you read it, consider what you might conclude about Justin's progress in writing. Consider, too, what inferences you might make about Justin's family and home life.

Figure 1.1 Seven-year-old Justin's story, "The Pet Who Came to Dinner."



The pet who Came to
Dinner. Owans ther was a
cat who Came to
Dinner he eat all the
food. He brink all the
metk. He brink the wodr
too. Owans He was dun
he ask for dasrt for
dasrt we wr aving cake
Ouns we broing out the
cake he rust ovre to us
and eat all the cake too.
Then he ran to the
nuwspapr and read and
read then he ran up
to my moms and dads bedrom
and stor did soreing.

As you can see, Justin has learned how to spell some words (e.g., *dinner, came*) but not others (e.g., he spells *once* as "owans" and *started* as "stor did"). Overall, he knows which alphabet letters represent which sounds in speech, but he sometimes reverses the letter *d* so that it looks like a *b*, and he occasionally leaves out sounds in his word spellings (e.g., his spelling of *drink* begins with *b* and omits the *n* sound). Justin has made some progress in common spelling patterns (e.g., the *-ing* suffix for verbs) and in the use of periods and apostrophes. He has learned to tell a simple story, but he does so merely by listing a series of seemingly unrelated events, and he hasn't yet learned that the title of a story should appear on a line by itself, centered at the top of the page.

Justin's story offers a few hints about home life as well. For instance, it appears that Justin lives with two parents, and he talks about the pet reading the newspaper ("nuwspapr"), suggesting that reading is a familiar activity at home. Are such inferences about Justin accurate? Not necessarily. The conclusions we reach about our students are—like the theories that researchers formulate about learning and development—only reasonable guesses based on the evidence at hand. We must think of such conclusions as tentative *hypotheses* to be tested further, rather than as indisputable *facts.*

Conducting Action Research

Like Anne Smith in the opening case study, teachers sometimes have questions that existing research findings don't fully answer.

In **action research**, teachers conduct systematic studies of issues and problems in their own schools, with the goal of seeking more effective strategies for working with students. For example, an action research project might involve examining the effectiveness of a new teaching technique, seeking students' opinions on a new classroom policy (as Ms. Smith does), or ascertaining reasons why many students rarely complete homework assignments.

Any action research study typically involves the following steps (described in greater depth in Mills, 2018):

1. *Identify an area of focus.* The teacher–researcher begins with a problem and gathers preliminary information that might shed light on the problem, perhaps by reading relevant books or journal articles, or discussing the issue with colleagues or students. The teacher–researcher then identifies one or more specific questions to address and develops a research plan (data collection techniques, necessary resources, schedule, etc.) for answering those questions. At this point, the teacher also seeks permission to conduct the study from school administrators and any other appropriate authorities. Depending on the nature of the study, parents' permission may be necessary as well.
2. *Collect data.* The teacher–researcher collects data relevant to the research questions. Such data might, for example, be obtained from questionnaires, interviews, tests, students' journals or portfolios, existing school records (e.g., attendance patterns, school suspension rates), observations, or any combination of these.
3. *Analyze and interpret the data.* The teacher–researcher looks for patterns in the data. Sometimes the analysis involves computing particular statistics (e.g., percentages, averages, correlation coefficients)—this would be a quantitative study. At other times, the analysis involves an in-depth, nonnumerical inspection of the data—this would be a qualitative study. In either case, the teacher–researcher relates the findings to the original research questions.
4. *Develop an action plan.* The final step distinguishes action research from the more traditional research studies described earlier in the chapter. In particular, the teacher–researcher uses the information collected to *take action*—for instance, to change instructional strategies, school policies, or the classroom environment.

Ultimately, good teachers are *informed* teachers—informed not only about evidence-based practices but also about their students' current abilities, needs, perspectives, and progress. With this final point, we authors welcome you to the field of educational psychology.

Chapter 1 What Have You Learned?

The beginning of the chapter lists five *learning objectives*—five general things you should accomplish—while reading and studying this chapter. Let's return now to these outcomes and identify key points related to each one.

1.1 **Reflect on and evaluate some of your existing knowledge and beliefs about human learning and effective instructional practices.** As teachers, we must make countless daily decisions about how to interact with, instruct, and guide students. Although we can sometimes use simple common sense in making these decisions, such "sense" may occasionally lead us to draw unwarranted and, occasionally, inaccurate conclusions. We are most likely to make good decisions—those that maximize students' learning and development over the long run—when we base them on contemporary research findings and on general principles and theories that synthesize those findings.

1.2 **Use effective strategies when you read and study.** Successful learning is active, strategic learning. A few simple strategies can greatly enhance your learning and memory of what you read and study. In particular, we authors urge you to (1) set one or more goals you want to accomplish in each study session; (2) connect new concepts and principles to things you already know; (3) embellish (elaborate) on the concepts and principles you learn, perhaps by drawing inferences or thinking of possible applications; (4) reconsider and possibly revise your existing beliefs when new information seems to discredit them; (5) tie abstract ideas to concrete examples; and (6) regularly check yourself to make sure you understand and can remember what you've read—for instance, by summarizing it or asking yourself questions about it.

1.3 **Develop a long-term plan for gaining expertise as a teacher.** Truly effective teachers are also lifelong learners. To maximize our development as teachers, we must think reflectively and critically about our assumptions, beliefs, and classroom strategies. We must also continue to revise what we think and do as we acquire new information related to our profession. Such information can come from a variety of sources, including formal coursework, in-service training sessions, professional journals and conferences, websites, and consultation and collaboration with colleagues and community members.

1.4 **Draw appropriate conclusions from various kinds of research studies.** Knowledge of findings from both quantitative and qualitative research can greatly enhance our teaching effectiveness, but different kinds of studies are appropriate for different kinds of issues and conclusions. Qualitative studies and descriptive quantitative studies can yield a great deal of information about *how things are* at the present time. Correlational quantitative studies enable conclusions about *what variables are associated with what other variables.* But only carefully controlled experimental studies—and, to a lesser extent, quasi-experimental studies—yield dependable conclusions about *what causes what.* In some cases, researchers effectively combine both quantitative and qualitative research methods to more fully address their research questions.

1.5 **Describe several strategies for collecting information about your own students.** To be effective teachers, we must regularly collect data about our students, sometimes by giving them preplanned assessments and sometimes by observing them "on the fly" as they act and interact in class, on the playground, and elsewhere. In addition, we may often find it helpful to conduct action research in order to address questions about our own particular students or about local issues and concerns.

Practice for Your Licensure Exam

New Software

High school math teacher Mr. Gualtieri begins his class one Monday with an important announcement: "Our school has just purchased a new instructional software program that we can use on our classroom computer tablets. This program, called Problem-Excel, will give you practice in applying the mathematical concepts and procedures we'll be studying this year. I strongly encourage you to use it whenever you have free time so that you can get extra instruction and practice with things you might be having trouble with."

Mr. Gualtieri is firmly convinced that the new software will help his students better understand and apply certain concepts in his math curriculum this year. To test his hypothesis, he keeps a record of which students use the software and which students do not. He then looks at how well the two groups of students perform on his next classroom test. Much to his surprise, he discovers that, on average, the students who have used the software have earned *lower* scores than those who have not used it. "How can this be?" he puzzles. "Is the software actually doing more harm than good?"

1. **Constructed-response question:**

   Mr. Gualtieri wonders whether the instructional software is actually hurting, rather than helping, his students. Assume that the software has been carefully designed by an experienced educator. Assume, too, that Mr. Gualtieri's classroom test is a good measure of how well his students have learned the material they've been studying.

   A. Explain why Mr. Gualtieri cannot draw a conclusion about a cause-and-effect relationship from the evidence he has. Base your response on principles of educational research.

   B. Identify another plausible explanation for the results Mr. Gualtieri has obtained.

2. **Multiple-choice question:**

   Which one of the following results would provide the most convincing evidence that the Problem-Excel software enhances students' mathematics achievement?

   a. Ten high schools in New York City purchase Problem-Excel and make it available to their students. Students at these high schools get higher mathematics achievement test scores than students at 10 other high schools that have *not* purchased the software.

   b. A high school purchases Problem-Excel, but only four of the eight math teachers at the school decide to have their students use it. The students of these four teachers score at higher levels on a mathematics achievement test than the students of the other four teachers.

   c. All tenth graders at a large high school take a mathematics achievement test in September. At some point during the next two months, each student spends 20 hours working with Problem-Excel. The students all take the same math achievement test again in December and, on average, get substantially higher scores than they did in September.

   d. Students at a high school are randomly assigned to two groups. One group works with Problem-Excel, and the other group works with a software program called Write-Away, designed to teach better writing skills. The Problem-Excel group scores higher than the Write-Away group on a subsequent mathematics achievement test.

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 2

Cognitive and Linguistic Development

Blend Images - JGI/Jamie Grill/Tetra images/Getty Images

Learning Objectives

2.1 Describe four principles portraying the general nature of child development and the interactive roles of heredity and environment in guiding it.

2.2 Explain how the brain and its development influence children's thinking and learning.

2.3 Apply Piaget's theory of cognitive development to classroom practice.

2.4 Apply Vygotsky's theory of cognitive development to classroom practice.

2.5 Describe developmental changes in language during the school years and explain how you might adapt instruction to children with diverse linguistic abilities and needs.

CASE STUDY

Carrots

Mrs. Bennington is teaching her first-grade students a brief unit about plants. When she asks her students to give her some examples of plants that they have seen, Keisha says, "We grow carrots in my garden, so we have carrot plants." Ben responds by saying, "Carrots are food, not plants." Keisha says, "Carrots are plants *and* food." Ben looks perplexed; he does not seem to understand how a carrot can be both a plant and a food.

- What should Mrs. Bennington do to help Ben understand that carrots are both plants and food?

The situation in Mrs. Bennington's classroom is actually quite typical of a first-grade classroom. Some children will understand seemingly obvious things, whereas others may not. There are several strategies that Mrs. Bennington can use with Ben. She might decide that this is confusing for Ben right now, and not try to push this topic. However, she also might decide to expand her topic to help her students explore plants that produce food, encouraging more advanced understanding for Ben and others.

As you consider this scenario, you can probably see that Keisha is able to understand that a carrot can be considered both a plant *and* a food; she can see that the same object can be classified in two different ways. However, Ben does not seem to be able to understand this. Mrs. Bennington is faced with the very typical situation of having students who are at different levels of cognitive development in the same classroom.

Classroom instruction must take into account the physical, cognitive, personal, and social characteristics and abilities that students at a particular age are likely to have, as well as differences between students. In this chapter, we'll look at general principles of development and then focus specifically on children's **cognitive development**—that is, developmental changes in thinking, reasoning, and language. As we look at these topics in the pages ahead, we'll be better able to understand Mrs. Bennington's dilemma.

General Principles of Human Development

Learning Objective 2.1 **Describe four principles portraying the general nature of child development and the interactive roles of heredity and environment in guiding it.**

As teachers, we need to always be aware that although the students in our classrooms may be similar to each other in age, they can be at very different places in terms of their readiness to learn and their skills at interacting with others. Two third-graders in the same classroom may be similar in height and weight, but differ greatly in terms of their readiness to learn. This chapter focuses on cognitive development, and the next chapter focuses on social aspects of development. There are four general principles that characterize all aspects of children's development (i.e., physical, cognitive, personal, and social development).

- *The sequence of development is somewhat predictable.* Although children live in diverse environments and cultures, the order in which they develop generally is the same. As children grow older, they reach various **developmental milestones**—new, developmentally more advanced behaviors—in predictable sequences. For example, children must be able to walk before they can run, and they must be able to count before they become capable of understanding fractions.

- *Children develop at different rates.* Not all children reach particular milestones at the same age; some reach them earlier, some later. Accordingly, we are likely to see considerable *diversity* in development at any single grade level. As teachers, we should never jump to conclusions about what individual students can and cannot do based on age alone. For example, some students in Mrs. Bennington's class appear to be able to understand that objects can sometimes be classified in several ways (e.g., as both a plant and a food), whereas this concept may be a bit too advanced for other students.
- *Development is often marked by periods of relatively rapid growth (spurts) between periods of slower growth (plateaus).* Development doesn't necessarily proceed at a constant rate. For example, toddlers may speak with a limited vocabulary and one-word "sentences" for several months, yet sometime around their second birthday their vocabulary expands rapidly and their sentences become increasingly longer within a few weeks. And after seemingly stalling out height-wise, many young adolescents undergo a growth spurt, shooting up several inches within a year or so. Occasionally, children even take a temporary step *backward* in development, apparently because they're in the process of revamping a particular physical or cognitive skill and are about to make a major leap forward (Gershkoff-Stowe & Thelen, 2004; Morra et al., 2008).

Keep in mind that students of any single age show considerable diversity in what they can and cannot do.

- Some researchers have suggested that such patterns of uneven growth reflect distinctly different periods, or *stages,* in development; you'll see an example in the discussion of Piaget's theory in this chapter. Others believe that most aspects of development can best be characterized as reflecting general *trends* that can't really be broken into discrete stages. Either way, early developmental advancements almost certainly provide a foundation on which later advancements can build—hence the predictable *this-before-that* nature of many developmental progressions.
- *Heredity and environment interact in their effects on development.* Many aspects of development are influenced either directly or indirectly by a child's genetic makeup (Ayorech et al., 2019). For example, soon after birth, children begin to show genetic inclinations, or *temperaments,* that predispose them to respond to physical and social events in certain ways—perhaps to be calm or irritable, outgoing or shy. Not all inherited characteristics appear so early, however. Heredity continues to guide a child's growth through **maturation**—a gradual, genetically driven acquisition of more advanced physical and neurological capabilities that affect both cognitive and social aspects of development over the course of childhood and adolescence. For example, motor skills, such as walking, running, and jumping, develop primarily as a result of neurological development, increased strength, and increased muscular control—changes that are largely determined by inherited biological "instructions."

Chapter 3 examines temperamental differences in greater depth.

Yet environmental factors also affect development. For example, although height and body build are primarily inherited characteristics, good nutrition and regular physical exercise also make a difference. And although children's behaviors and social interactions are partly the result of inherited temperaments, the ways in which their environment encourages them to behave are just as influential. For example, research indicates that the quality of both in-home and preschool experiences can affect children's language and cognitive development (Hall et al., 2013; Justice et al., 2017; Lin et al., 2017). When children attend high-quality preschools (i.e., schools in which the teachers actively use strategies that promote children's conceptual and linguistic development), language and literacy skills in particular increase.

Many researchers have examined the degree to which various human characteristics are the result of heredity versus environment—an issue often referred to as *nature versus nurture.* But increasingly, researchers have come to realize that heredity and environment interact in ways we can probably never disentangle (e.g., Cole, 2009; Johnson, 2010; Spencer et al., 2009). First, genes need environmental support in order to do their work. For instance, a child with "tall" genes can grow tall only if good nutrition supports such growth. Furthermore, some genetically driven maturational processes seem to be characterized by **sensitive periods**—age-related time periods during which certain environmental conditions are especially important for normal development (we'll see examples in the upcoming sections on the brain and language development). In addition, children's inherited characteristics may lead other people to treat them in particular ways. For instance, a physically attractive child often will be accepted more readily by peers than a less attractive one, and a hyperactive child might be disciplined more harshly than a quieter one. Finally, children can *choose* their environments to some extent, especially as they get older, and they're apt to seek out situations that match their inherited temperaments and abilities. Children and adolescents actively and intentionally *think about* and *act on* their environments, and in doing so they alter their environments—and the effects of those environments—in significant ways (Mareschal et al., 2007; Nettles et al., 2008; Nuemi, 2008).

The Multiple Layers of Environmental Influence: Bioecological Systems and the Importance of Culture

As we consider the various ways in which the environment might influence children's development, we must be careful that we don't limit our thinking only to children's immediate surroundings. In fact, as developmental theorist Urie Bronfenbrenner has pointed out in his **bioecological systems theory**, any large society encompasses several "layers" of environment that all have significant impacts on children's development and are, in turn, either directly or indirectly influenced by the other layers and by the children themselves (Bronfenbrenner, 2005; Bronfenbrenner & Ceci, 1994; Bronfenbrenner & Morris, 1998).

Figure 2.1 depicts the various layers of influence that Bronfenbrenner has proposed. More specifically:

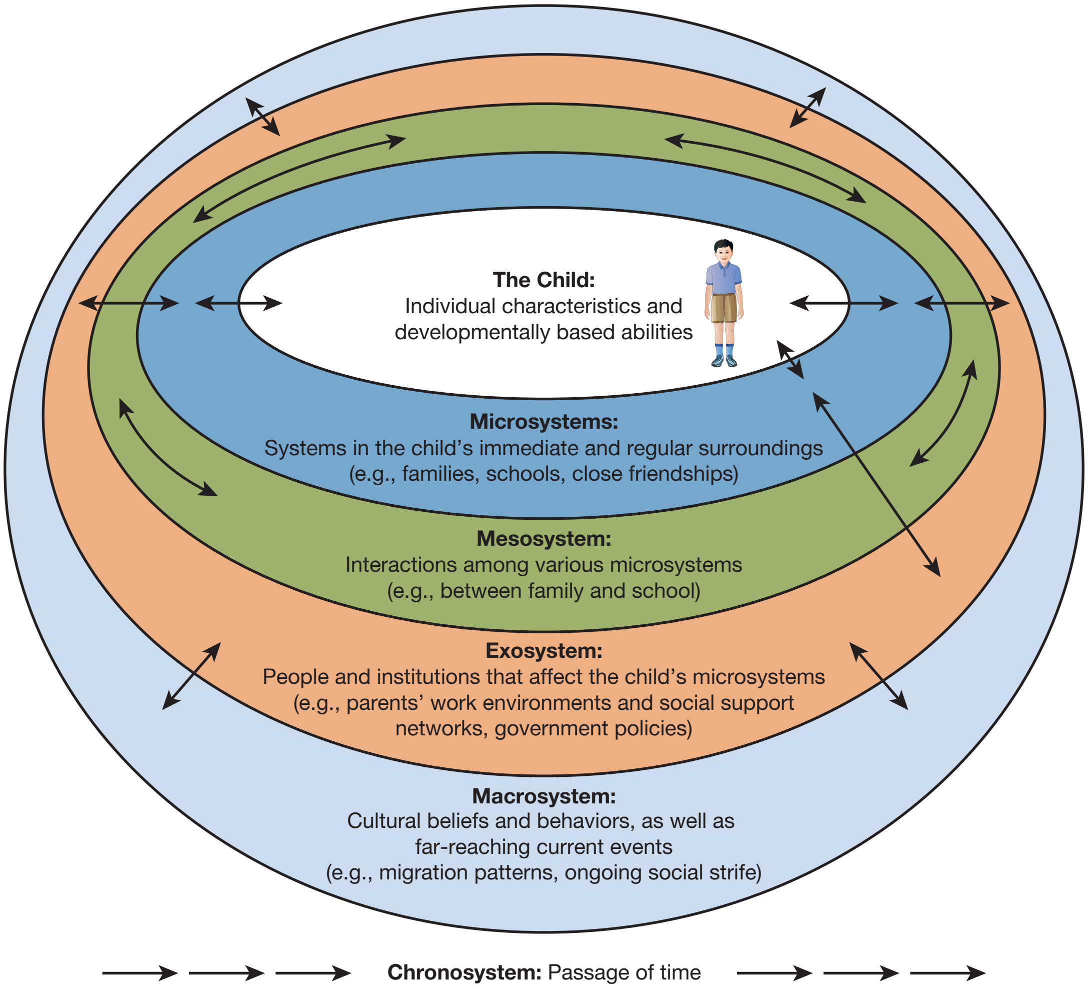
1. The *child* is at the center of this system. And in some ways, children are who they are—they have distinct physical features and personalities. Moreover, each individual child is unique in terms of their current developmental levels (e.g., cognitive abilities and interpersonal skills). These individual characteristics of each child influence the child's behaviors in any given situation.
2. The child is immersed in various *microsystems*—everyday contexts (e.g., family, school, friendships) that both influence and are influenced by the child's characteristics and behaviors.
3. The microsystems in which a child lives and grows *influence one another* in what Bronfenbrenner has called a *mesosystem.* For example, a hyperactive child might initially elicit stringent disciplinary actions at school (one microsystem) but concerned parents (another microsystem) might actively seek out the child's teachers and suggest alternative strategies that can channel the child's behaviors into more productive activities.
4. The people (e.g., teachers) and institutions (e.g., schools) that children regularly encounter are called the *exosystem*. Exosystems indirectly affect the child's development through their influences on various microsystems. For example, the nature of parents' employment can affect their ability to provide adequate living quarters, nutrition, and health care for their family, and a good social support network can provide parents with advice, assistance, and emotional support in challenging circumstances.
5. A child's exosystem is enmeshed within an even broader *macrosystem,* which includes a society's general beliefs, ideological perspectives, and behavior patterns, as well as far-reaching current events (e.g., war, migration patterns, ongoing social or political strife). For example, the *Black Lives Matter* and *Me Too* movements in the United States in some cases have led to policy changes that have effects on families

and social networks (Williams et al., 2019); these changes can have indirect and direct effects on children's development.

6. Children and the systems in which they grow up all change over time—in part because they influence one another—in what Bronfenbrenner has called a *chronosystem* (see the bottom set of arrows in Figure 2.1). For example, teachers' instructional practices might change as researchers report new findings, government agencies might provide websites that help parents and teachers more effectively foster children's cognitive development, and society's general beliefs and practices can change as two or more subgroups regularly interact. In general, children's environments are *dynamic systems* encompassing mutually influencing variables that are in constant flux (also see Lee, 2010; Perone & Simmering, 2017).

A key factor affecting *all* of these systems is a child's **culture**—the behaviors and belief systems that characterize any longstanding social group of which the child is a member. Culture is pervasive in many aspects of a child's home environment—for instance, in the behaviors parents and other family members encourage, the disciplinary practices parents use, the books children have access to, the television shows they watch, the social media that they engage with, and so on. Culture influences broader environmental contexts as well—for instance, by offering certain outlets for leisure time (e.g., basketball courts, cultural celebrations such as Cinco de Mayo or Chinese New Year celebrations), and by advocating or discouraging certain activities (e.g., seeking a college degree, getting a part-time job, participating in school athletic teams).

Figure 2.1 In Bronfenbrenner's bioecological systems perspective, growing children affect and are affected by multiple systems that are nested within one another and change over time.


The Child:
Individual characteristics and
developmentally based abilities
Microsystems:
Systems in the child's immediate and regular surroundings
(e.g., families, schools, close friendships)
Mesosystem:
Interactions among various microsystems
(e.g., between family and school)
Exosystem:
People and institutions that affect the child's microsystems
(e.g., parents' work environments and social support
networks, government policies)
Macrosystem:
Cultural beliefs and behaviors, as well as
far-reaching current events
(e.g., migration patterns, ongoing social strife)
Chronosystem: Passage of time

Ultimately, culture is an inside-the-head thing as well as an out-there-in-the-world thing: It provides an overall framework by which a child comes to determine what things are normal and abnormal, true and not true, rational and irrational, good and bad (Cole, 2006; Shweder et al., 1998). And when the culture that a child experiences at home is poorly aligned with the culture that the child experiences at school, both students and their parents may become somewhat disconnected and disengaged with schools (Henderson et al., 2020; Tyler et al., 2018).

Role of the Brain in Learning and Development

Learning Objective 2.2 **Explain how the brain and its development influence children's thinking and learning.**

One key player in children's cognitive development is, of course, the brain. Research on the brain is constantly evolving. We are going to provide a very basic overview of the brain, but as we discuss later in the chapter, there isn't much research suggesting that educators can impact students' learning and development by focusing on the physiology of the brain. The human brain is an incredibly complicated organ that includes several *trillion* cells. About 100 billion of them are nerve cells, or **neurons**, that are microscopic in size and interconnected. Some neurons receive information from the rest of the body, others synthesize and interpret that information, and still others send messages that tell the body how to respond to its present circumstances. Accompanying neurons are perhaps 1 trillion to 5 trillion **glial cells**, which serve a variety of specialized functions and surround the neurons.

Every neuron has numerous branchlike structures, called *dendrites,* that receive messages from other neurons (see Figure 2.2). Every neuron also has an *axon,* a long, armlike structure that transmits information to still other neurons. The axon may branch out many times, and the ends of its branches have *terminal buttons* that contain certain chemical substances. For some (but not all) neurons, much of the axon has a white, fatty coating called a *myelin sheath.*

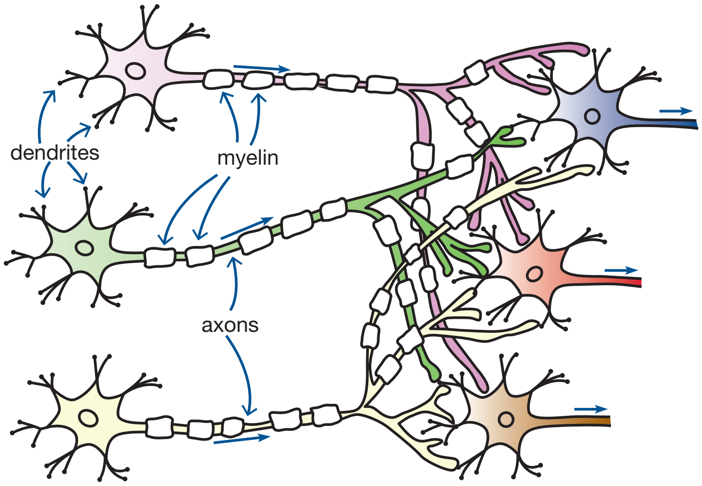
When a neuron's dendrites are stimulated by other neurons—which might also be in the brain or, instead, might extend from other parts of the body—the dendrites become electrically charged. If the charge reaches a certain level, the neuron fires, sending an electrical impulse along its axon to the terminal buttons. If the axon has a myelin sheath, the impulse travels quite rapidly because it leaps from one gap in the myelin to the next, almost as if it were playing leapfrog. If the axon doesn't have a myelin sheath, the impulse travels more slowly.

Neurons don't actually touch one another. Instead, they send chemical messages to their neighbors across tiny spaces known as **synapses**. When an electrical impulse moves along a neuron's axon, it signals the terminal buttons to release chemicals known as **neurotransmitters** that travel across the synapses and stimulate neighboring neurons. Any single neuron may have synaptic connections with hundreds or even thousands of other neurons (Lichtman, 2001).

With these basics in mind, let's consider four key points about the brain and its role in cognitive development.

- *Different parts of the brain have different specialties, but they all work closely with one another.* The structures in the lower and middle parts of the brain specialize in

Figure 2.2 Neurons and their interconnections.



essential physiological processes (e.g., breathing), habitual body movements (e.g., riding a bicycle), and basic perceptual skills (e.g., diverting attention to potentially life-threatening stimuli). Complex, conscious thinking takes place primarily in the **cortex**, which rests on the top and sides of the brain. The part of the cortex located just behind the forehead, known as the *prefrontal cortex,* is largely responsible for a wide variety of very human activities, including sustained attention, planning, reasoning, decision making, coordination of complex activities, creativity, and inhibition of nonproductive thoughts and behaviors. Other areas of the cortex are actively involved in interpreting visual and auditory information, identifying the spatial characteristics of objects, and retaining general knowledge about the world.

To some degree, the left and right halves of the cortex—its two *hemispheres*—also have somewhat distinct specialties. For most people, the left hemisphere takes primary responsibility for language and logical thinking, whereas the right hemisphere is more dominant in visual and spatial tasks (Byrnes, 2001; Ornstein, 1997; Siegel, 2012). Yet contrary to a popular belief, people rarely, if ever, think exclusively in one hemisphere. There's really no such thing as "left-brain" or "right-brain" thinking: The two hemispheres constantly collaborate in day-to-day tasks. In fact, learning or thinking about virtually anything, even a fairly simple idea, tends to be *distributed* across many parts of the brain (Bressler, 2002; Gonsalves & Cohen, 2010; Haxby et al., 2001).

- *Learning and cognitive development involve changes in synapses, neurons, and glial cells.* Much of human learning involves strengthening existing synapses between neurons or forming new ones. Sometimes, however, making progress actually involves *eliminating* synapses. Effective learning requires not only that people think and do certain things but also that they *not* think and do other things—in other words, that they inhibit tendencies to think or behave in particular ways (Davidson, 2011; Lichtman, 2001; Merzenich, 2001). In addition, a good deal of learning seems to involve the formation of new neurons or glial cells (Koob, 2009; Spalding et al., 2013). Brain-imaging studies suggest that there is a positive correlation between the density of connections between various brain regions and traditionally measured intelligence (Seidlitz et al., 2018).
- *Developmental changes in the brain enable increasingly complex and efficient thought.* Neurons begin to form synapses long before a child is born. But shortly after birth, the rate of synapse formation increases dramatically. Neurons sprout new dendrites in many directions, and so they come into contact with a lot of their neighbors, especially in the first two or three years of life. Much of this early **synaptogenesis** appears to be driven primarily by genetic programming rather than by learning experiences. Thanks to synaptogenesis, children in the elementary grades have many more synapses than adults do (Bruer, 1999; Nelson, et al., 2006).

  As children encounter different stimuli and experiences in their daily lives, some synapses come in quite handy and are used repeatedly; others are largely useless, and these gradually fade away through another genetically driven process known as **synaptic pruning**. This process continues throughout the elementary and secondary school years and into adulthood. Most synaptic pruning is a *good* thing—not a bad one—because it eliminates "nuisance" synapses that are inconsistent with typical environmental events and appropriate responses. Synaptic pruning, then, may be Mother Nature's way of making the brain more efficient (Bruer & Greenough, 2001; Bryck & Fisher, 2012; Huttenlocher & Dabholkar, 1997).

  Another important developmental process in the brain is **myelination**. When neurons first develop, their axons have no myelin sheath. As they acquire this myelin over time, they fire much more quickly, greatly enhancing the brain's overall efficiency. Myelination continues throughout childhood, adolescence, and early adulthood, especially in the cortex (Giedd et al., 2012; Merzenich, 2001; Paus et al., 1999).

  In addition, the onset of puberty is marked by significant changes in hormone levels, which affect the continuing maturation of brain structures and possibly also affect the production and effectiveness of neurotransmitters (Shen et al., 2010; Walker, 2002). Such changes can have an effect on adolescents' functioning in a variety of areas, including attention, planning, and impulse control. To some degree, adolescents' abilities to learn and respond appropriately may temporarily *decrease* until brain functioning restabilizes (McGivern et al., 2002; Shen et al., 2010; Steinberg, 2009).

- *The brain remains adaptable throughout life.* One of the characteristics of the brain is its **plasticity**, which refers to the brain's ability to adapt and change when we experience new situations (Kolb et al., 2017). Plasticity persists throughout the lifespan (Chein & Schneider, 2012; Nelson et al., 2006). The early years are important for development, to be sure, but so are the later years. For most topics and skills, there isn't a single "best" or "only" time to learn (Bruer, 1999; Byrnes & Fox, 1998; Geary, 1998, 2008).

  Some aspects of cognitive development do appear to have sensitive periods in which certain kinds of environmental stimulation are crucial. For example, if infants don't have normal exposure to patterns of light (e.g., if congenital cataracts make them functionally blind), they may soon lose the ability to see normally. And if children don't hear spoken language in the first few years of life, they're apt to have trouble mastering some of its complexities once they *do* begin to hear it. However, seeing patterned light and hearing spoken language are *normal* experiences, not exceptional ones. Some recent research even suggests that adolescence may be a critical period for the development of complex, higher-order cognition (Larsen & Luna, 2018), but there is *no* evidence to indicate that sensitive periods exist for academic subjects such as reading and mathematics.

Applying Brain Research

Taking Developmental Changes in the Brain into Account

Be careful—many recently published books and articles about "using brain research" and "brain-based learning" either misrepresent or misapply research about brain development. There are many myths about the brain and learning that have little basis in science. The following three recommendations are consistent with current knowledge about the brain and how it changes with age.

- Provide reasonable stimulation for young children; don't overload them with new information and activities for fear of their "losing synapses." Some well-meaning educators have proposed that the proliferation of new synapses in the preschool and early elementary years points to a sensitive period in brain development. Accordingly, they urge us to maximize children's educational experiences—providing reading instruction, violin lessons, art classes, and the like—during this time period. Before you, too, jump to such a conclusion, consider this point: Although adequate nutrition and everyday forms of stimulation are critical for normal brain development, there is *no* evidence that jam-packed, information- and skills-intensive experiences in the early years enhance brain power over the long run (Thompson & Nelson, 2001). With young children, try to provide them with a broad range of experiences to help them to develop academic skills (Chambers et al., 2010).
- Adolescents' brains are not yet fully matured. Synaptic pruning and myelination—two developmental processes that enhance the brain's efficiency—continue throughout adolescence and beyond. Adolescents' brains are *not* adult brains, especially in the prefrontal cortex—that part of the brain that controls sustained attention, planning, reasoning, impulse control, creativity, and other abilities so important for independent learning and responsible behavior (Kleibeuker, et al., 2016; Reyna et al., 2012; Steinberg, 2009). For example, sometimes adolescents cheat on exams or assignments because they are more impulsive than their parents or teachers realize (Anderman et al., 2009). Thus, many middle-school and high-school students need considerable structure, guidance, and support to get and keep them on track.
- Be optimistic that students of all ages can learn a wide variety of new topics and skills. For some content areas—for instance, in music and foreign languages—instruction in the preschool or early elementary years appears to mold the brain somewhat differently than does instruction later on (Hyde et al., 2009; Kuhl et al., 2005). Furthermore, children of differing ages have differing levels of prior knowledge and experience on which to draw as they work to acquire new information and skills. But ultimately, we must keep in mind the *plasticity* of the human brain: With reasonable effort, practice, and support, human learners of any age can master a great many things.

The field of neuroscience is developing rapidly. Although research on the human brain may have the potential to offer implications for how we teach students in schools in the future, our current knowledge about brain function has not been clearly linked to specific strategies to foster students' learning and cognitive development (Bassett & Mattar, 2017). As researchers gradually identify how the brain works and develops, they're also beginning to get clues about how we can best foster children's and adolescents' cognitive development. Three research-based recommendations are presented in the Applying Brain Research feature "Taking Developmental Changes in the Brain into Account" (Anderson, 2014; Byrnes, 2007; Miller, 2010; Varma et al., 2008). If we want to understand the nature of human learning and cognitive development, we must look primarily at what psychologists, rather than neurologists, have discovered. Two early theories—those of Jean Piaget and Lev Vygotsky—have been especially influential in shaping contemporary views of how children learn and develop.

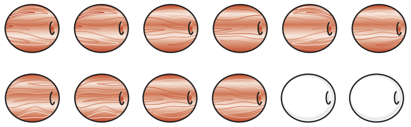
Piaget's Theory of Cognitive Development

Learning Objective 2.3 **Apply Piaget's theory of cognitive development to classroom practice.**

Do you think of yourself as a logical person? Just how logical *are* you? Try out your logical reasoning abilities in the following exercise.

Experiencing Firsthand

Beads, Beings, and Basketballs



Take a moment to solve the following three problems:

1. Above are 12 wooden beads: 10 brown ones and 2 white ones. Are there more brown beads or more wooden beads?
2. If all children are human beings,
   And if all human beings are mammals,
   Then must all children be mammals?
3. If all children are basketballs,
   And if all basketballs are candy,
   Then must all children be candy?

You undoubtedly found the first problem quite easy; there are, of course, more wooden beads than brown beads. And when you read the second problem, you probably concluded fairly quickly that, yes, all children must be mammals. The third problem is a bit tricky: It follows the same line of reasoning as the second, but the logical conclusion—all children must be candy—contradicts what is true in reality.

In the early 1920s, Swiss biologist Jean Piaget began studying children's responses to problems of this nature. He used an approach he called the **clinical method**, in which an adult presents a task or a problem and asks a child a series of questions about it, modifying later questions based on the child's responses to previous ones. For example, let's look at what happened when a researcher in Piaget's laboratory presented the wooden beads problem to a 6-year-old, whom we'll call Brian[1]:

> ***Adult:*** Are there more wooden beads or more brown beads?
>
> ***Brian:*** More brown ones, because there are two white ones.
>
> ***Adult:*** Are the white ones made of wood?
>
> ***Brian:*** Yes.
>
> ***Adult:*** And the brown ones?
>
> ***Brian:*** Yes.
>
> ***Adult:*** Then are there more brown ones or more wooden ones?
>
> ***Brian:*** More brown ones. (Dialogue from Piaget, 1952a, pp. 163–164)

During further questioning, Brian continued to assert that the brown beads outnumbered the wooden beads. In an effort to help him see otherwise, the adult asked him to draw two necklaces, one made of the brown beads and another made of the wooden beads. Brian drew a series of black rings for the brown-beads necklace; he drew a series of black rings plus two white rings for the wooden-beads necklace.

> ***Adult:*** Good. Now which will be longer, the one with the brown beads or the one with the wooden beads?
>
> ***Brian:*** The one with the brown beads. (Dialogue from Piaget, 1952a, p. 164)

Piaget suggested that young children such as Brian have trouble with **class inclusion** tasks in which they must think of an object as simultaneously belonging to a category and to one of its subcategories—in this case, thinking of a bead as being both *brown* and *wooden* at the same time. Piaget found that many 4- and 5-year-olds have difficulty with class inclusion tasks such as the beads problem, but that 7- and 8-year-olds almost always respond to such tasks correctly. He also found that 10-year-olds have an easier time with logic problems that involve real-world phenomena (such as categories and subcategories of living creatures) than with problems involving hypothetical and contrary-to-fact ideas (such as candy children), whereas many adolescents can effectively deal with both kinds of problems. These observations, which we will discuss in greater detail, have obvious implications for classroom instruction.

Piaget and his colleagues discovered a great deal about what and how children think about the world around them (e.g., Inhelder & Piaget, 1958; Piaget, 1929, 1952b, 1959, 1970, 1980). Piaget integrated his findings into a theory of cognitive development that has made major contributions to contemporary understandings of children's learning and development.

Piaget's Basic Assumptions

Piaget introduced a number of concepts to describe and explain the changes in logical thinking he observed in children and adolescents.

- *Children are active and motivated learners.* Piaget noticed that children want to learn! They are naturally curious, and they actively seek out new information so that they can make sense of their worlds. They love to play and experiment with new things and try out new ideas.
- *Children construct rather than absorb knowledge.* As a prospective teacher, you may think about learning as a one-way process: the teacher "teaches" the students. However, as Piaget observed, children don't just passively soak up a collection of isolated facts. Instead, they pull their experiences together into an integrated view of how the world operates. Although teachers may provide students with

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[1] Piaget used abbreviations to identify specific children in his studies. In this case, he used the letters *BRI*, but we've given the child a name to allow for easier discussion.

wonderful experiences and information, students ultimately construct their own knowledge by synthesizing these various experiences. For example, by observing that objects always fall down (never up) when dropped, children begin to construct a basic understanding of gravity. As they interact with family pets, visit farms and zoos, and look at picture books, they develop more complex understandings of animals. Because Piaget proposed that children construct their own beliefs and understandings from their experiences, his theory is sometimes called a *constructivist* theory or, more generally, **constructivism**.

In Piaget's terminology, the things children do and know are organized as **schemes**—groups of similar actions or thoughts that are used repeatedly in response to the environment. Initially, children's schemes are largely behavioral in nature, but over time they become increasingly mental and, eventually, abstract. For example, an infant may have a putting-things-in-mouth behavioral scheme that she applies to a variety of objects, including her thumb, cookies, and toys. A 7-year-old may have a mental scheme for identifying snakes that includes their long, thin bodies; lack of legs; and slithery nature. A 13-year-old may have an abstract scheme for what constitutes *fashion,* allowing them to classify certain peers as being either really cool or "total losers."

Over time, children's schemes are modified with experience, and many become integrated with one another. For instance, children begin to take hierarchical interrelationships into account: They learn that poodles, golden retrievers, and German shepherds are all dogs; that dogs, snakes, and birds are all animals; and that both animals and plants are living organisms. A progressively more organized body of knowledge and thought processes allows children to think in increasingly intricate and logical ways, and to learn increasingly complex information as they progress through school.

- *Children continually learn new things through two complementary processes: assimilation and accommodation.* **Assimilation** involves responding to or thinking about an object or event in a way that's consistent with one's current way of thinking (i.e., with one's existing scheme). For example, an infant may assimilate a new teddy bear into her putting-things-in-mouth scheme. A 7-year-old may quickly identify a new slithery creature in the garden as a snake. A 13-year-old may readily label a classmate's clothing as being either quite fashionable or "so yesterday."

  But sometimes children can't easily interpret and respond to a new object or event using their existing schemes. In these situations, children need to adjust their current ways of thinking to make better sense of this newly learned information. This process is referred to as **accommodation**. Accommodation can occur in two ways: Children either (1) modify an existing scheme to account for the new object or event or (2) form a new scheme in order to make sense of the new object or event. For example, an infant may have to open her mouth wider than usual to accommodate a teddy bear's fat paw. A 13-year-old may have to revise his existing scheme of fashion according to changes in what's hot and what's not. A 7-year-old who encounters a long, slithery creature with four legs may realize that she can't apply the *snake* scheme (snakes don't have legs) and thus, after some consideration, may acquire a new scheme—*salamander.*

  Through the processes of assimilation and accommodation, children are able to adapt to new situations. Assimilation and accommodation typically work hand in hand as children develop their knowledge and understanding of the world. Children interpret each new event within the context of their existing knowledge (assimilation), but at the same time may modify their knowledge as a result of the new event (accommodation). Accommodation rarely happens without assimilation: children can benefit from, or accommodate to, new experiences only when they can relate those experiences to their current knowledge and beliefs. As assimilation and accommodation occur, these adjustments in children's thinking result in cognitive development (Miller, 2011).

When introducing a new concept or procedure, show students how it relates to something they already know.

- *Interactions with one's physical and social environments are essential for cognitive development.* According to Piaget, active experimentation with the physical world is critical for cognitive development. By exploring and manipulating physical objects—for instance, fiddling with sand and water, playing games with balls and bats, and conducting science experiments—children come to understand more complex and abstract concepts (e.g., Sim & Xu, 2017). For example, playing with sand and water ultimately can help children to see the effects of erosion, which is a rather complex concept; playing with balls and bats helps children discover principles related to force and gravity.

  In Piaget's view, interaction with other people is equally important. Frequent social interactions—both pleasant (e.g., normal conversations with friends) and unpleasant (e.g., conflicts about sharing and fair play)—help children realize that different people see things differently, and that their own view of the world isn't necessarily completely accurate, logical, or shared by others. As children get older, discussions and disagreements about complex issues and problems can help them recognize and reexamine inconsistencies in their own reasoning.
- *A process of equilibration promotes progression toward increasingly complex thought.* Piaget suggested that children are often in a state of **equilibrium**: They can comfortably interpret and respond to new events using existing schemes. But as they grow older and expand their horizons, they sometimes encounter situations for which their current knowledge and skills are inadequate. Such situations create **disequilibrium**, a sort of mental discomfort that stimulates them to try to make sense of what they're observing. By replacing, reorganizing, or better integrating certain schemes (i.e., through accommodation), children can better understand and address previously puzzling events. The process of moving from equilibrium to disequilibrium and back to equilibrium again is known as **equilibration**. In Piaget's view, equilibration, along with children's intrinsic desire to achieve equilibrium, promotes the development of more complex levels of thought and knowledge.

  Occasionally induce disequilibrium by presenting puzzling phenomena that students cannot easily explain using their existing understandings.

  For example, young children develop an understanding of how to open a door. As they see family members turn doorknobs and pull open a door, they develop a scheme for how to open doors. Now suppose that one day the child tried to turn the doorknob, but the door doesn't open (because it was locked). Whereas the child was in a state of equilibrium (with regard to how doorknobs work), the locked door creates disequilibrium. The child might be confused and even a bit scared when they realize that the door is not opening. Suppose an older sibling observes the child's frustration and shows the child how to unlock the door. As the younger child comes to understand how locks work, they are experiencing the process of equilibration. Eventually, once the child fully understands the relationship between locks and doorknobs, they are again in a state of equilibrium.

  Let's return to Brian's responses to the beads problem. Recall that the adult asked Brian to draw two necklaces, one made with the brown beads and one made with the wooden beads. The adult presumably hoped that after Brian drew a brown-and-white necklace that was longer than an all-brown necklace, he would notice that his drawings were inconsistent with his statement that there were more brown beads. The inconsistency might have led Brian to experience disequilibrium, perhaps to the point where he would revise his conclusion. In this case, however, Brian was apparently oblivious to the inconsistency, remained in equilibrium, and thus had no need to revise his thinking.
- *In part as a result of maturational changes in the brain, children think in qualitatively different ways at different ages.* Long before researchers knew much about how the brain changes with age, Piaget speculated that it *does* change in significant ways, and that such changes enable more complex thought processes. He suggested that major neurological changes take place throughout childhood. These changes allow new abilities to emerge, such that children progress through a sequence of stages that reflect increasingly sophisticated thought. As you've already learned, the

brain does, in fact, continue to develop throughout childhood and adolescence, but whether some of its changes enable the cognitive advancements Piaget described is still an open question.

Piaget's Proposed Stages of Cognitive Development

As mentioned earlier, some developmental theorists argue that development occurs in predictable stages, and that these stages can be described in terms of specific developmental milestones. Piaget's theory is one such stage theory. Piaget proposed that as a result of brain maturation, experiences in children's physical and social environments, and children's natural desire to make sense of and adapt to their world, cognitive development proceeds through four distinct stages, with the last three being constructed from children's accomplishments in the preceding stages (e.g., Piaget, 1971). Thus, the stages are *hierarchical*—each stage provides a foundation for any subsequent ones—and so children progress through them in a specific order.

Table 2.1 summarizes Piaget's four stages and presents examples of abilities acquired during each. As you look at the table, please keep three things in mind: First, as children *transition* from one stage to the next, they may display characteristics of two adjacent stages at the same time. Second, as children gain abilities associated with the more advanced stages, they don't necessarily leave behind the characteristics they acquired in previous stages. Finally, many researchers—including Piaget himself—suggest that the four stages better describe how children and adolescents *can* think, rather than how they always *do* think, at any particular age (Flavell, 1994; Halford & Andrews, 2006; Klaczynski, 2001; Tanner & Inhelder, 1960).

The preoperational, concrete operations, and formal operations stages all occur during the school years, and so we'll look at these three stages more closely.

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Table 2.1 Piaget's Proposed Stages of Cognitive Development

Stage	Proposed age Range[a]	General Description	Examples of Abilities Acquired
Sensorimotor Stage	Begins at birth	Schemes are based largely on behaviors and perceptions. Especially in the early part of this stage, children cannot think about things that are not immediately in front of them, and so they focus on what they are doing and seeing at the moment ("out of sight, out of mind").	• Trial-and-error experimentation with physical objects; mostly exploration and manipulation • Object permanence: The realization that objects continue to exist even when removed from view • Symbolic thought that allows representation of physical objects and events as mental entities (*symbols*)
Preoperational Stage	Emerges at about age 2	Rapid development of symbolic thinking abilities allows children to think and talk about things beyond their immediate experience.	• Rapid expansion of vocabulary and grammatical structures • Extensive pretend play • Intuitive thought: Some logical thinking (especially after age 4), but based primarily on hunches and intuition
Concrete Operations Stage	Emerges at about age 6 or 7	Adult-like logic emerges, but is limited to reasoning about concrete, real-life situations.	• Distinction between one's own and others' perspectives and recognition that people's thoughts and feelings may differ • Class inclusion: Ability to classify objects as belonging to two or more categories simultaneously • Conservation: Realization that amount stays the same if nothing is added or taken away, regardless of appearance
Formal Operations Stage	Emerges at about age 11 or 12[b]	Logical reasoning processes are applied to abstract ideas as well as to concrete objects and situations. Many capabilities essential for advanced reasoning in science and mathematics appear.	• Logical reasoning about abstract, hypothetical, and contrary-to-fact ideas that have no basis in physical reality • Proportional reasoning, e.g., understanding fractions, percentages, decimals, and ratios • Formulation of multiple hypotheses about possible cause-and-effect relationships • Separation and control of variables to test hypotheses • Idealism: The ability to envision alternatives to current social and political practices, sometimes unrealistically

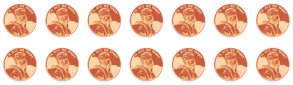
[a] The age ranges presented in the table are *averages*; some children reach more advanced stages a bit earlier, others a bit later. Also, some children may be in *transition* from one stage to the next, displaying characteristics of two adjacent stages at the same time.

[b] Researchers have found considerable variability in when adolescents begin to show reasoning processes consistent with Piaget's formal operations stage. Furthermore, not all cultures value or nurture formal operational logic, perhaps because it is largely irrelevant to people's daily lives and tasks in those cultural groups.

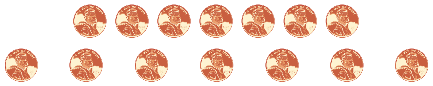
Preoperational Stage (Age 2 through Age 6 or 7) In the early part of the **preoperational stage**, children's language skills virtually explode, and the many words in their rapidly increasing vocabularies serve as *symbols* that enable them to mentally represent and think about a wide variety of objects and events. However, preoperational thought has some definite limitations, especially when compared to the concrete operational thinking that emerges later. For example, Piaget described young children as exhibiting **preoperational egocentrism**: They don't yet have sufficient reasoning abilities to look at a situation as someone else might look at it. Thus, preschoolers might play games together without checking to be sure they're all playing by the same rules.

Young children's thinking also tends to be somewhat illogical at times, at least from an adult's point of view. We've already seen how young children have difficulty with class inclusion problems (recall Brian's insistence that the brown beads outnumber the wooden ones). In addition, they're apt to have trouble with **conservation**: They fail to realize that if nothing is added or taken away, the amount of a substance or set of objects must stay the same regardless of changes in appearance. As illustrations, consider what happens when we present two conservation tasks to 5-year-old Izan:

> *Conservation of liquid:* We show Izan the three glasses in Figure 2.3. We ask him whether Glass A and B contain the same amount of water, and he replies confidently that they do. We then pour the water from Glass B into Glass C and ask him whether Glass A and Glass C have the same amount. Izan replies, "No, that glass [pointing to Glass A] has more because it's taller."
>
> *Conservation of number:* We next show Izan two rows of seven pennies each, like so:

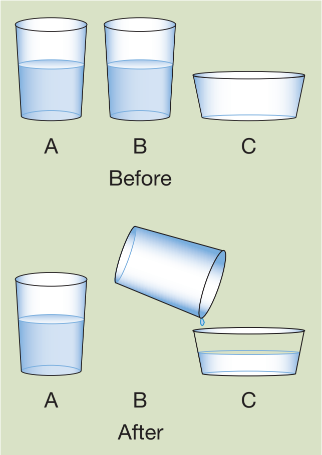


> Izan counts the pennies in each row and agrees that the two rows have the same amount. We spread the second row out, and the pennies now look like this:



> When we ask Izan whether the two rows still have the same number, he replies, "No, this one [pointing to the bottom row] has more because it's longer."

Figure 2.3 Do Glasses A and C contain the same amount of water?

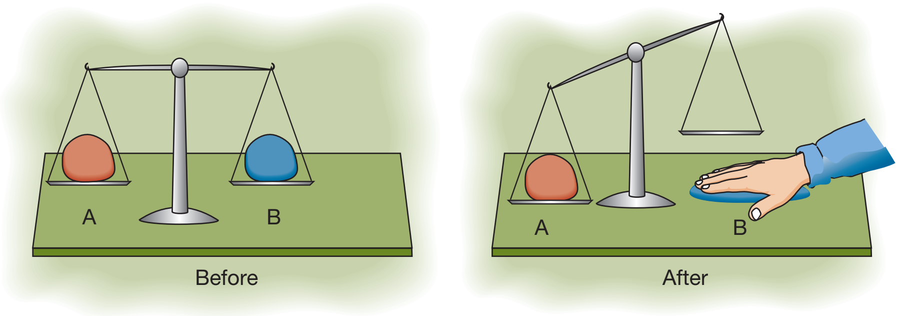


As children approach the later part of the preoperational stage, perhaps at around age 4 or 5, they show early signs of adult-like logic. For example, they sometimes draw correct conclusions about class inclusion and conservation problems. But they often base their reasoning on hunches and intuition, rather than on any conscious awareness of underlying logical principles, and thus they can't yet explain *why* their conclusions are correct.

Concrete Operations Stage (Age 6 or 7 through Age 11 or 12) Piaget proposed that as children enter the **concrete operations stage**, their thought processes become organized into larger systems of mental processes—*operations*—that allow them to think more logically than they have previously. They now realize that their own perspectives and feelings aren't necessarily shared by others and may reflect personal opinions rather than reality. They also exhibit such logical reasoning abilities as class inclusion and conservation. For example, they should readily conclude, as you presumably did in an earlier Experiencing Firsthand exercise, that in a group of brown and white wooden beads, there obviously must be more wooden beads than brown ones.

Children continue to refine their newly acquired logical thinking capabilities for several years. For instance, some forms of conservation, such as conservation of liquid and conservation of number, appear at age 6 or 7, whereas other forms emerge later. Consider the problem in Figure 2.4. Using a balance scale, an adult shows a child that two balls of

Figure 2.4 Conservation of weight: Ball A and Ball B initially weigh the same. When Ball B is flattened into a pancake shape, how does its weight now compare with that of Ball A?



clay have the same weight. One ball is removed from the scale and smashed into a pancake shape. Does the pancake weigh the same as the unsmashed ball, or are the weights different? Children typically don't achieve conservation of weight—they don't realize that the flattened pancake weighs the same as the round ball it was earlier—until about age 9 (Morra et al., 2008). Despite these general guidelines, however, recent research suggests that children can, in fact, understand principles of conservation at younger ages than Piaget had postulated (Sophian, 2013). We will discuss this in more detail later.

Children also develop the ability to classify objects as belonging to more than one category at this time. Do you remember the example at the beginning of the chapter about the students in Mrs. Bennington's class? Keisha was able to understand that a carrot could be considered as both a plant and a food, whereas Ben could not. Teachers of children at this age need to be aware of these developing abilities; they need to understand that although the children may all be around the same

Figure 2.5 A science assignment that would be appropriate for children in the concrete operational stage:

<table>
<tr><th>Pallas' Cat</th><th>Jungle Cat</th><th>Sand Cat</th><th>Chinese Desert Cat</th></tr>
<tr><td>
Igor Pushkarev/Shutterstock</td><td>
thsulemani/Shutterstock</td><td>
Alexandr Junek Imaging/ Shutterstock</td><td>
ylq/Shutterstock</td></tr>
<tr><td>Scientific Name: *Felis manul*
Habitat: Grassland biomes and in the mountain steppe and semi-arid desert habitats characteristic of central Asia.
Unique Characteristics:
1. Usually have six to seven narrow black stripes on their body.
2. Range from 2.5 to 5 grams.
3. They are small but heavy due to their long fluffy fur coats.
Food Source: The majority of Pallas' cats eat small rodents and pikas.
Domain: Eukarya
Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Carnivora
Family: Felidate
Genus: Felis
Species: manul</td><td>Scientific Name: *Felis chaus*
Habitat: Jungle cats prefer habitats near water with dense vegetative cover
Unique Characteristics:
1. In the wild they live up to 14 years.
2. Some of its predators are humans, leopards, and large snakes.
3. The range of their length is 70 to 120 centimeters.
Food Source: Commonly consume rodents, lizards, snakes, frogs, birds, hare, fish, insects, livestock.
Domain: Eukarya
Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Carnivora
Family: Felidate
Genus: Felis
Species: chaus</td><td>Scientific Name: *Felis margarita*
Habitat: Dry habitats such as deserts
Unique Characteristics:
1. Smallest of all wild cats.
2. Lives up to 13 years in captivity.
3. Not good climbers or jumpers, but are good diggers.
Food Source: Sand cats are mostly carnivorous and eat a variety of prey such as gerbils, and voles, hares, spiders, reptiles, birds, insects and venomous snakes.
Domain: Eukarya
Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Carnivora
Family: Felidate
Genus: Felis
Species: margarita</td><td>Scientific Name: *Felis bieti*
Habitat: Alpine meadows, steppe grasslands, mountain shrub lands, and on the edges of high elevation coniferous
Unique Characteristics:
1. Known predators for this cat are wolves and brown bears.
2. The only know endemic cat of China.
3. The home range of Chinese mountain cats is unknown.
Food Source: Chinese mountain cats are carnivores; they eat primarily small mammals such as pikas, zokors.
Domain: Eukarya
Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Carnivora
Family: Felidate
Genus: Felis
Species: bieti</td></tr>
<tr><td colspan="2">• The animals that are closest related is all of them because they have the same domain, kingdom, phylum, class, order, family, genus, but their species are different.
• None of the animals are least related because they are similar through genus.</td><td colspan="2">• All of my animals have the same domain, kingdom, phylum, class, order, family, and genus.
• The only characteristic about my animal is their species.</td></tr>
</table>

age, they may not all be able to understand some concepts clearly. In Figure 2.5, you will see an example of a science assignment that was completed by a child in the concrete operational stage. The assignment asks the students to gather information about four different types of cats, and then to identify similarities and differences.

Although students displaying concrete operational thought show many signs of logical thinking, their cognitive development isn't yet complete. For example, they have trouble understanding abstract ideas, and they may struggle with problems involving fractions and other proportions.

Formal Operations Stage (Age 11 or 12 through Adulthood) As teachers, we often may feel tempted to ask our students to think about very interesting, yet somewhat abstract concepts. However, Piaget's theory suggests that children are not able to engage in truly complex thinking about abstract concepts until they reach the fourth stage, known as **formal operations stage**. Once students progress from the concrete operational stage into formal operations, they can think about concepts that have little or no basis in concrete reality—for instance, abstract concepts, hypothetical ideas, and contrary-to-fact statements. Thus, they begin to find underlying meanings in proverbs such as *Absence makes the heart grow fonder* and *All that glitters is not gold.* They can also recognize that what is logically valid might be different from what is true in the real world. For example, recall the earlier children-basketballs-candy problem: *If* all children are basketballs and *if* all basketballs are candy, then formal operational thinkers can logically conclude that all children must be candy, even though in the real world children *aren't* candy.

Think about why this is important for teachers—you probably would not want to be presenting your students with lessons that are well beyond their current cognitive abilities! For example, from Piaget's perspective, students' mathematical abilities are likely to improve when formal operational thinking develops. Abstract math problems should become easier to solve. And students should become capable of understanding such concepts as *negative numbers, pi* (π), imaginary numbers, and *infinity.* Although students may struggle to understand how temperature can be below zero during concrete operations, they should be better able to understand once they are capable of formal operational thought. They also should be able to better understand geometry principles (e.g., how two parallel lines will never touch each other). In addition, because students can now understand proportions, they can more easily use fractions, decimals, and ratios when solving problems.

Scientific reasoning is also likely to improve when students are capable of formal operational thought. Three of the formal operational abilities listed in Table 2.1—reasoning logically about hypothetical ideas, formulating multiple hypotheses, and

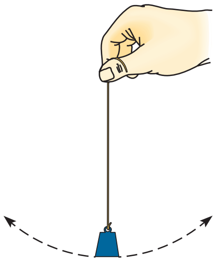
Experiencing Firsthand

Pendulum Problem

In the absence of other forces, an object suspended by a rope or string—a pendulum—swings at a constant rate. (A yo-yo and a playground swing are two everyday examples.) Some pendulums swing back and forth rather slowly; others move more quickly. What characteristics of a pendulum determine how quickly it swings? Jot down at least three hypotheses about the variable(s) that might affect a pendulum's oscillation rate.

Now gather several small objects of varying weights (e.g., a paper clip, a house key, a heavy bolt) and a piece of string. Tie one of the objects to one end of the string and set your pendulum in motion. Conduct one or more experiments to test each of your hypotheses.

What can you conclude? What variable or variables affect the rate at which a pendulum swings?



separating and controlling variables—together allow many adolescents to use the *scientific method,* in which they test several possible explanations for an observed phenomenon in a systematic manner. As an example, consider the pendulum problem in the following exercise.

What hypotheses did you generate? Four common ones involve weight of the object, length of the string, force with which the object is pushed, and height from which the object is released. Did you test each of your hypotheses in a systematic fashion? That is, did you *separate and control variables,* testing one at a time while holding all others constant? For example, if you were testing the hypothesis that weight makes a difference, you might have tried objects of different weights while keeping constant the length of the string, the force with which you pushed each object, and the height from which you released or pushed each one. Similarly, if you hypothesized that length was a critical factor, you might have varied the string length while continuing to use the same object and setting the pendulum in motion in a consistent manner. If you carefully separated and controlled each variable, you should have come to the correct conclusion: Only *length* affects a pendulum's oscillation rate.

An additional outcome of abstract and hypothetical thinking is the ability to envision how the world might be different from the way it actually is. In some cases, adolescents envision a world that is *better* than the one they live in, and they exhibit considerable concern and idealism about social and political issues. Some secondary school students devote a great deal of energy to local or global problems, such as climate change, immigration, or animal rights. However, they may offer recommendations for change that seem logical but aren't practical in today's world. For example, a teenager might argue that racism could disappear overnight if people would just begin to "love one another," or that their country should simply eliminate its armed forces and weaponry as a way of moving toward world peace. Piaget proposed that adolescent idealism reflects **formal operational egocentrism**, an inability to separate one's own logical abstractions from the perspectives of others and from practical considerations. Only through experience do adolescents eventually begin to temper their optimism with some practicality about what is possible in a given time frame and with limited resources.

Encourage adolescents to discuss their visions for a better world, but point out instances when their ideals are unrealistic.

Critiquing Piaget's Theory

Many aspects of Piaget's theory have stood the test of time and continue to influence classroom instruction. In particular, Piaget's suggestion that children actively construct their own knowledge about the world has influenced the types of curricula used in many classrooms. As you will see in later chapters, there are now many types of curricula available across a range of subject areas that encourage students to solve problems and to try out a variety of ideas, thus encouraging them to construct their own knowledge. When children encounter puzzling phenomena. this can sometimes spur them to revise their understandings.

Piaget's descriptions of processes that *propel* development—especially assimilation, accommodation, and equilibration—can be frustratingly vague, however (diSessa, 2006; Klahr, 2001). And interaction with one's physical environment, although certainly valuable, may be less critical than Piaget believed. For instance, children with significant physical disabilities, who can't actively experiment with physical objects, learn a great deal about the world simply by observing what happens around them (Bebko et al., 1992; Brainerd, 2003).

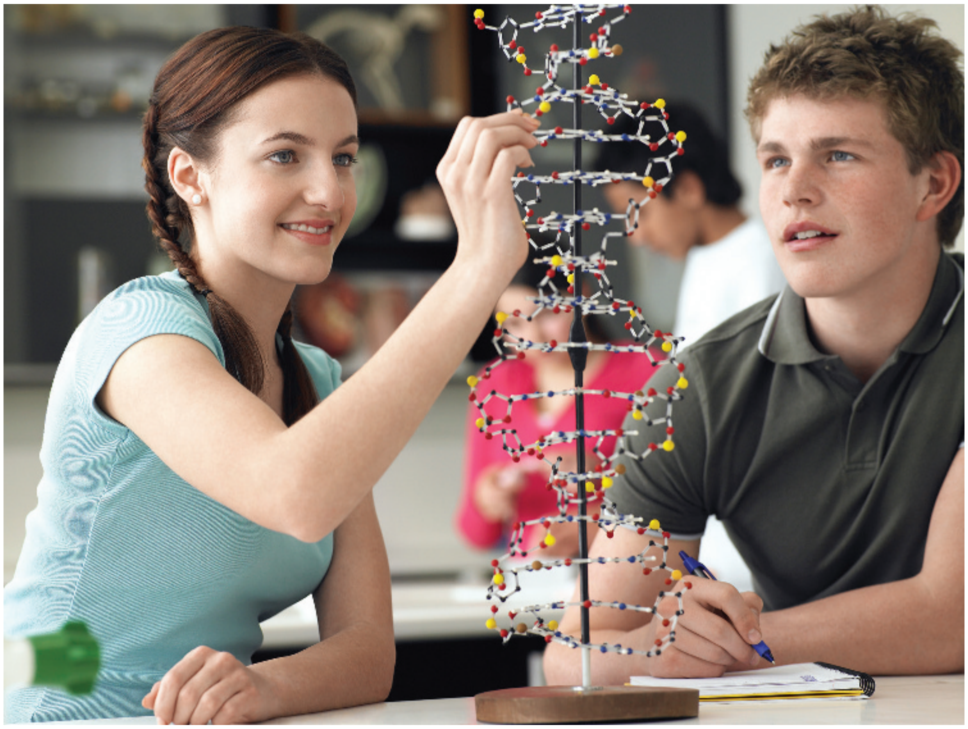
A Second Look at Piaget's Stages Piaget's proposal that cognitive development progresses in stages has sparked a great deal of follow-up research. In general, this research supports Piaget's proposed *sequence* in which different abilities emerge, but not necessarily the *ages* at which they emerge. Piaget probably underestimated the thinking capabilities of very young children, preschoolers and elementary school students (e.g., Brierley, 2018). For example, infants are actually able to mentally categorize some objects (e.g., according to shape) (Owen & Barnes, 2021; Wasserman & Rovee-Collier, 2001). Under some circumstances, preschoolers are capable of class inclusion and conservation, and they have some ability to comprehend abstract and contrary-to-fact ideas (Beck et al., 2006; Goswami & Pauen, 2005; McNeil & Uttal, 2009; Rosser, 1994). Many first and second graders can understand and use simple proportions (e.g., ½, ⅓, ¼) if they can relate the proportions to everyday objects and situations (Van Dooren et al., 2005). And some older elementary school children can separate and control variables if a task is simplified in some way (Lorch et al., 2010; Metz, 1995).

Yet Piaget seems to have *over*estimated what adolescents can do (Babakr et al., 2019. Formal operational thinking processes emerge more gradually than he suggested, and even high school students and adults don't necessarily use them regularly (Flieller, 1999; Kuhn & Franklin, 2006; Morra et al., 2008; Tourniaire & Pulos, 1985; Vonk et al., 2020). Many adolescents seem to better understand abstract ideas when those ideas are accompanied by concrete examples and materials (Blair & Schwartz, 2012; Kaminski & Sloutsky, 2012). In Figure 2.7, note how these students, who are learning about the structure of DNA, benefit from working with a physical model that depicts the structure of DNA. Furthermore, students may demonstrate formal operational thought in one subject (e.g., social studies) while thinking concretely in another (e.g., math) (Lovell, 1979; Tamburrini, 1982).

Even in the high school grades, accompany abstract ideas with concrete examples and experiences.

Explicit training and other structured experiences can sometimes help children acquire reasoning abilities sooner than Piaget thought was possible (Brainerd, 2003; Kuhn, 2006; Lutz & Sternberg, 1999; Protzko et al., 2013). For example, children as young as age 4 or 5 begin to show conservation after having experience with conservation

Figure 2.6 Although adolescents are developing the ability to understand complex topics, they often still benefit from working with concrete examples.



sirtravelalot/Shutterstock

tasks, especially if they can actively manipulate the task materials and discuss their reasoning with someone who already exhibits conservation (Halford & Andrews, 2006; Siegler & Chen, 2008; Siegler & Lin, 2010). Figure 2.4 is an example of such a conservation task, involving weight. Similarly, instruction with concrete or graphic materials can help children and adolescents better understand how to work with fractions and other proportions (Fujimura, 2001; Jitendra et al., 2011; Sarama & Clements, 2009). In the upper elementary grades, children become increasingly able to separate and control variables when they have many experiences that require them to do so, they can more easily solve logical problems involving hypothetical ideas if they're taught relevant problem-solving strategies, and they can have more sophisticated discussions about social issues when they are provided with opportunities to discuss such issues in small groups (Kuhn & Pease, 2008; Lee, 1985; Lin et al., 2019; Lorch et al., 2014; Schauble, 1990). The essay presented in Figure 2.7 was written by a fifth grader, in response to a question about whether a boy (Kevin), whose family has limited income, should help a homeless person that they encountered. Considering that fifth graders are, on average 10–11 years old, can you identify aspects of both concrete and formal operations in this essay?

Thus, whereas Piaget proposed a fairly structured, **universal** ordering to cognitive development, more recent research suggests that there is more variation in how children's thinking skills develop over time, and that this variation is attributable in some ways to context. For example, recent research indicates that cognitive development is affected in particular by diet of pregnant mothers and newborn babies (i.e., cognitive abilities in children seem to be positively affected by specific dietary supplements), exposure of children to early educational interventions, interactively reading with children, and attendance at a preschool (Price & Kalil, 2019; Protzco et al., 2013).

In light of such evidence, most researchers believe that the logical thinking abilities Piaget described emerge in gradual, trend-like ways rather than in discrete stages. Nevertheless, as you'll see shortly, some theorists have offered stage-based theories that might account for children's logical reasoning in specific skill areas or content domains.

Considering Diversity from the Perspective of Piaget's Theory

As a researcher working in Switzerland, Piaget conducted his studies with a particular population: Swiss children. However, the course of cognitive development appears to vary somewhat from one cultural group to another, probably because

Figure 2.7 A fifth grader's thoughts on whether a family should help a homeless person

If I was Kevin I would not help the homeless guy just yet. I know what you're thinking, "What a heartless person not helping the homeless guy. What did he ever do to you?" My answer is nothing. So you might be wondering, "Then why wouldn't you help him?" I never said I wouldn't help him entirely, I just said not yet. Here let me explain further.

To start off, Kevin's family is struggling. Both his parents work part-time jobs and are almost never together, due to work. They can barely afford their own kid's Christmas present let alone give money to people they don't know. Not only that but, they don't even know what he's going to do with that money like Kevin's brother said, "The guy would just probably spend your Christmas gift on some booze and something like that." They have no idea what this guy is going to do with their money. It would be a different story if they had money to spare but, when that money could be going towards their meals or rent and they're down on their luck I wouldn't risk it. In addition, the tax rise is a problem too. Kevin's parents were talking about how one of them would have to pick up another job to keep up with them. If they can't take care of them self's how are they supposed to take care of others?

But, in the Summer and Spring sessions, Kevin could take up work like mowing lawns or walking dogs. With that extra money, he could go around giving it to homeless people. He could also, start a club at school to help give things to the homeless like blankets, clothes, food, water, etc. Those are both good ways to help the homeless. In conclusion, if I was Kevin I would not help the homeless guy just yet.

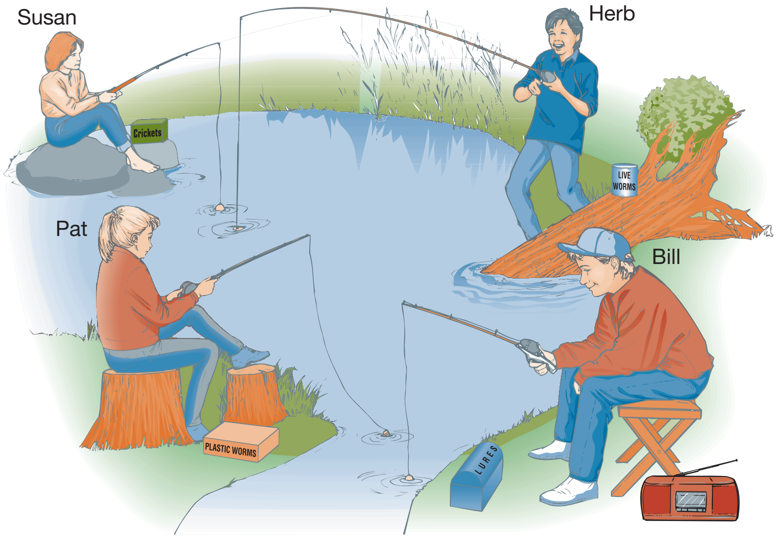
different cultures provide somewhat different experiences (Liu et al., 2008; Molitor & Hsu, 2019). For example, Mexican children who have had considerable experience in hand-weaving complex flower, animal, and geometric designs show preoperational and concrete operational abilities in new weaving problems sooner than do their same-age counterparts in the United States; the difference remains even if the U.S. children are given explicit training in the Mexican weaving techniques (Maynard & Greenfield, 2003). And Mexican children whose families make pottery for a living acquire conservation skills earlier than their peers in other Mexican families, probably because making pottery requires children to make frequent judgments about needed quantities of clay regardless of the clay's shape (Price-Williams et al., 1969).

Formal operational reasoning skills—for example, reasoning about hypothetical ideas and separating and controlling variables—also vary from culture to culture (Flieller, 1999; Norenzayan et al., 2007; Rogoff, 2003). Mainstream Western culture actively nurtures these skills through formal instruction in such academic content domains as science, mathematics, literature, and social studies. In some other cultures, however, such skills may have little relevance to people's daily lives (Cole, 1990; Miller, 1997; Norenzayan et al., 2007).

Even within a single cultural group, logical reasoning abilities vary considerably from one individual to another, in part as a result of differences in background knowledge about particular topics. For example, adolescents (adults, too) often apply formal operational thought to topics about which they know a great deal yet think concretely about topics with which they're unfamiliar (Girotto & Light, 1993; Linn et al., 1989; Schliemann & Carraher, 1993). As an illustration, in a study by Pulos and Linn (1981), 13-year-olds were shown a picture similar to the one in Figure 2.8 and told, "These four children go fishing every week, and one child, Herb, always catches the most fish. The other children wonder why." If you look at the picture, you can see that Herb differs from the other children in several ways, including his location, the bait he uses, and the length of his fishing rod. Students who had fished a great deal separated and controlled variables more effectively for this situation than they did for the pendulum problem presented earlier, whereas the reverse was true for students with little or no fishing experience.

Moreover, experiences with diversity can enhance cognitive development, particularly among older adolescents. Many colleges offer coursework and workshops focusing on diversity, and these do promote positive outcomes such as critical, abstract thinking (Bowman et al., 2016); however, social interactions among students with racially diverse peers may be particularly helpful in this regard (Page, 2017).

Figure 2.8 What are some possible reasons that Herb is catching more fish than the others?



SOURCE: Based on image created by Steven Pulos. Adapted with permission.

Contemporary Extensions and Applications of Piaget's Theory

Despite its shortcomings, Piaget's theory has had considerable influence on present-day thinking about cognitive development and classroom practice. A few contemporary *neo-Piagetian* theories integrate elements of Piaget's theory with current theories of thinking and learning. Furthermore, educators have found many of Piaget's ideas quite useful in instructional settings. We'll examine three of his ideas—his clinical method, his emphasis on the importance of hands-on experiences, and his concept of disequilibrium—in upcoming sections. The Into the Classroom feature "Applying Piaget's Theory" offers additional suggestions for translating Piaget's ideas into classroom practice.

Neo-Piagetian Theories **Neo-Piagetian theories** echo Piaget's belief that cognitive development depends somewhat on brain maturation. For instance, some neo-Piagetian theorists suggest that a component of the human memory system known as *working memory* is especially important for cognitive development. Working memory is a brain-based mechanism that enables people to temporarily hold and think about a small amount of new information. Children's working memory capacity increases with age, and thus their ability to think about several things at the same time also increases (Case & Mueller, 2001; Fischer & Bidell, 2006; Lautrey, 1993).

You will learn more about working memory in Chapter 7.

Neo-Piagetian theorists reject Piaget's notion that a single series of stages characterizes children's overall cognitive development. However, they speculate that cognitive development in specific content domains—for example, in understanding numbers or spatial relationships—often has a stagelike nature (e.g., Case, 1985; Case & Okamoto, 1996; Fischer & Immordino-Yang, 2002). Children's entry into a particular stage is marked by the acquisition of new abilities that they practice and gradually master over time. Eventually, they integrate these abilities into more complex structures that mark their transition into a subsequent stage. Thus, as is true in Piaget's theory, the stages are *hierarchical*, with each one being constructed out of abilities acquired in the preceding stage.

Into The Classroom

Applying Piaget's Theory

- **Use Piaget's stages as a rough guide to what students at different grade levels can do, but don't take them too literally.**

  Knowing from both research and her own experience that 6- and 7-year-olds can understand simple proportions in familiar situations, a first-grade teacher asks her students to tackle this problem: "Two children want to share five cupcakes so that each child gets the same amount. Show how much each child can have." When some of the students decide that each child can have two cupcakes, she points to the fifth cupcake and says, "They want to share this one too. How can they do that?"

- **When young children show signs of egocentric thinking, express confusion or explain that others think differently.**

  A kindergartner asks, "What's this?" about an object that is out of the teacher's view. The teacher responds, "What's *what?* I can't see the thing you're looking at."

- **Relate abstract and hypothetical ideas to concrete objects and observable events.**

  To help students understand that even seemingly weightless substances such as air have mass and weight, an eighth-grade teacher blows up a balloon and places it on one side of a balance scale. She then places an uninflated balloon on the other side of the scale. The inflated balloon tips the scale downward, showing that it weighs more than the uninflated one.

- **Ask students to explain their reasoning about physical phenomena, and challenge illogical explanations.**

  When learning about pendulums, cooperative groups in a middle school science class conduct experiments with three variables (weight, length, and angle at which the pendulum is dropped) to see which variable or variables determine the rate at which a pendulum swings. After three of four students in one group assert that weight affects the oscillation rate, the teacher asks a series of questions that eventually lead the group to realize it has simultaneously varied both weight and length in its experiments.

- **Draw on adolescents' idealism to engage them in public service projects and other charitable endeavors.**

  In a unit on nutrition, several students in a ninth-grade health class express their concern about "food deserts" in some neighborhoods in their city. The teacher mentions that a friend volunteers at a local food bank that provides fresh produce to residents. Over the next few days, the students ask their parents and neighbors for donations to contribute to the food bank.

SOURCES: Empson, 1999, p. 295 (cupcake example); C. L. Smith, 2007 (balloon example).

Even in a particular subject area, however, cognitive development isn't necessarily a single series of stages through which children progress as if they were climbing rungs on a ladder. In some cases, development might be better characterized as progression along "multiple strands" of skills that occasionally interconnect, consolidate, or separate in a weblike fashion (Fischer & Daley, 2007; Fischer & Immordino-Yang, 2002). From this perspective, children may acquire more advanced levels of competence in a particular area through any one of several pathways. For instance, as they become increasingly proficient in reading, children may gradually develop various word decoding and reading comprehension skills, and they draw on all of these skills when reading a book. However, the rate at which each skill is mastered varies from one child to the next.

Piaget's Clinical Method as an Assessment Tool Earlier we considered Piaget's clinical method, in which an adult probes children's thoughts about a particular task or problem through a sequence of individually tailored questions (recall the dialogue with Brian about the wooden beads). By presenting a variety of Piagetian tasks involving either concrete or formal operational thinking skills (e.g., conservation or separation and control of variables) and asking students to explain what they're thinking, we can gain valuable insights into their logical reasoning abilities (e.g., diSessa, 2007). We need not stick to traditional Piagetian reasoning tasks, however. To illustrate, a teacher might present various kinds of maps (e.g., a road map of Spain, an aerial map of Los Angeles, a three-dimensional relief map of a mountainous area) and ask students to interpret what they see. Children in the early elementary grades are apt to interpret maps very concretely, perhaps thinking that lines separating states and countries are actually painted on the Earth. They might also have difficulty with the scale of a map, perhaps thinking that a line can't be a road because "it's not fat enough for two cars to go on" or that a mountain depicted by a bump on a relief map isn't really a mountain because "it's not high enough" (Liben & Myers, 2007, p. 202). Understanding the concept of *scale* in a map requires proportional reasoning—an ability that doesn't fully emerge until after puberty—and thus it's hardly surprising that young children will be confused by it.

Probe students' reasoning about various logical thinking tasks and problems.

Hands-on Experiences Piaget suggested that exploration of the physical environment should be largely a child-initiated and child-directed effort. Young children can certainly learn a great deal from their informal interactions with sand, water, and other natural substances (Hutt et al., 1989). And in the elementary and secondary school grades, opportunities to manipulate physical objects—or their virtual equivalents on a computer screen—can enhance students' understanding of basic mathematical and scientific concepts Brown et al., 2009; Lorch et al., 2010; Sarama & Clements, 2009; Sherman & Bisanz, 2009).

Researchers are finding, however, that hands-on experiences are typically more effective *when combined with instruction* that helps students draw appropriate conclusions from what they observe (Fujimura, 2001; Hardy et al., 2006; Mayer, 2004). In the absence of teacher guidance and directive questions, students may draw inferences based solely on what they see and feel—for instance, erroneously concluding that a very small piece of Styrofoam must have no weight whatsoever—and they may fail to separate and control variables in their experimentation (Brown et al., 2009; Lorch et al., 2014; Smith, 2007). In addition, it can be tempting to utilize readily available technological resources (e.g., websites or videos) to provide students with virtual hands-on experiences; these can be powerful educational tools, but teachers need to keep in mind that students may not have acquired necessary cognitive skills to take full advantage of the technology. For example, a teacher may discover a website that relates to their current science topic; nevertheless, some

Combine hands-on experiences with age-appropriate instruction that enables students to draw appropriate conclusions from their observations.

students may still require hands-on experiences with concrete examples, rather than abstract representations from a website.

Have students wrestle with complex issues and problems in small groups, where they can hear opinions and arguments that might conflict with their own ways of thinking. Monitor such interactions to be sure that they are mutually respectful and socially appropriate.

Creating Disequilibrium: The Value of Sociocognitive Conflict As noted earlier, interaction with peers helps children realize that others often view the world differently than they do and that their own ideas aren't always completely logical or accurate. Furthermore, interactions with age-mates that involve wrestling with contradictory viewpoints—interactions that involve **sociocognitive conflict**—create disequilibrium that may spur children to reevaluate and possibly revise their current understandings. Whereas children may accept an adult's ideas without argument, some may be quite willing to disagree with and challenge the ideas of their peers (Johnson & Johnson, 2009b; Lampert et al., 1996; Linn, 2008).

Ultimately, social interaction—not only with peers but also with adults—is probably even more important for children's cognitive development than Piaget realized. Lev Vygotsky's theory, which we turn to now, describes additional ways in which interactions with fellow human beings promote cognitive growth.

Vygotsky's Theory of Cognitive Development

Learning Objective 2.4 **Apply Vygotsky's theory of cognitive development to classroom practice.**

In Piaget's view, children are largely in control of their own cognitive development; for example, they initiate interactions with objects in their environment and develop self-constructed understandings of what they observe. Lev Vygotsky, a Russian developmentalist, proposed a different model of cognitive development. Rather than assuming that the child has control over cognitive development, Vygotsky acknowledged that children are almost constantly interacting with adults. He proposed that it is these interactions with adults that actually drive cognitive development. Vygotsky's theory is a **sociocultural theory**; he emphasized the influence of social and cultural factors on children's cognitive growth.

Instead of determining the kinds of tasks children could successfully perform *on their own* (as Piaget did), Vygotsky often examined the kinds of tasks children could complete *only with adult assistance*. For example, he described two hypothetical children who could, without help, do things that a typical 8-year-old might be able to do. He would give each of the children progressively more difficult tasks and offer a little bit of assistance, perhaps by asking a leading question or suggesting a reasonable first step. With such help, both children could almost invariably tackle more difficult tasks than they could handle on their own. However, the *range* of tasks that the two children could complete with assistance might be quite different, with one child stretching their abilities to succeed at typical 12-year-old-level tasks and the other succeeding only with typical 9-year-old-level tasks (Vygotsky, 1934/1986, p. 187).

Western educators were largely unfamiliar with Vygotsky's work until the last few decades of the 20th century, when his major writings were translated from Russian into English (e.g., Vygotsky, 1934/1986, 1978, 1997). Although Vygotsky never had the chance to develop his theory fully, his views are clearly evident in many contemporary theorists' discussions of learning and development and have become increasingly influential in guiding teachers' classroom practices (Moll, 2014). As you will see, Vygotsky's theory provides a rationale for teachers being actively involved in supporting students' learning and development, thus fostering the enhancement of cognitive abilities.

Vygotsky's Basic Assumptions

Vygotsky acknowledged that biological factors—such as maturational processes in the brain—play a role in cognitive development (Ghassemzadeh et al., 2013). Children bring certain characteristics and dispositions to the situations they encounter, and their responses vary accordingly. Vygotsky also acknowledged that children's behaviors, which are influenced in part by inherited traits, affect the particular experiences they have (Vygotsky, 1997). However, Vygotsky's primary focus was on the role of children's social and cultural environments in fostering cognitive growth—and especially in fostering those complex mental abilities that are unique to humans. These are some of the central ideas and concepts in Vygotsky's theory:

- *Through both informal conversations and formal schooling, adults convey to children the ways in which their culture interprets and responds to the world.* Vygotsky proposed that as adults interact with children, they share the *meanings* they attach to objects, events, and, more generally, human experience. In the process they transform, or *mediate,* the situations children encounter. Meanings can be conveyed through a variety of mechanisms, including language (spoken words, writing, etc.), mathematical symbols, graphic displays, fine arts, and music.

  Informal conversations are one common mechanism through which adults pass along culturally relevant ways of interpreting situations. But even more important is formal education, through which teachers systematically impart the ideas, concepts, and terminology used in various academic disciplines (Vygotsky, 1934/1986). Although Vygotsky, like Piaget, saw value in allowing children to make some discoveries themselves, he also saw value in having adults pass along the discoveries of previous generations (Vygotsky, 1934/1986).

Help students understand how different academic disciplines can enhance their ability to make sense of various physical and social events and phenomena in their lives.

- *Every culture passes along physical and cognitive tools that make daily living more productive and efficient.* Not only do adults teach children specific ways of interpreting experiences but they also pass along specific tools and strategies that can help children tackle the various tasks and problems they're apt to face. Some tools, such as scissors, sewing machines, and computers, are physical objects; others, such as writing systems, maps, and spreadsheets, are partly physical and partly symbolic. Still others, such as the concept of *adjective,* may have little physical basis at all. In Vygotsky's view, acquiring tools that are at least partly symbolic or mental in nature—**cognitive tools**—greatly enhances children's thinking and functioning as they develop.
- *Thought and language become increasingly interdependent in the first few years of life.* One very important cognitive tool is language. For us as adults, thought and language are closely interconnected. We often think by using specific words that our language provides. For example, when we think about household pets, our thoughts may contain such words as *dog* and *cat.* In addition, we usually express our thoughts when we converse with others. In other words, we "speak our minds."

  Vygotsky proposed that thought and language are separate functions for infants and young toddlers. In these early years, thinking occurs independently of language, and when language appears, it's first used primarily as a means of communication rather than as a mechanism of thought. But sometime around age 2, thought and language start to become intertwined: Children start expressing their thoughts when they speak, and they begin to think in words.

  When children start to think with language, they often talk to themselves—a phenomenon known as **self-talk** (you may also see the term *private speech*). Vygotsky suggested that self-talk serves an important function in cognitive development. By talking to themselves, children learn to guide and direct their own behaviors through difficult tasks and complex maneuvers in much the same way that adults have previously guided them. Self-talk provides a window into the emerging thought processes of young children (Nelson, 2015). Although self-talk occurs both privately and in the presence of others, research suggests that it may occur somewhat more often when others are present (McGonigle-Chalmers et al., 2014). Self-talk eventually evolves into **inner speech**, in which children talk to themselves mentally rather than aloud. They continue to direct themselves verbally through tasks and activities, but others can no longer see and hear them do it (Vygotsky, 1934/1986). In other words, both self-talk and inner speech help children engage in *self-regulation*.

- *Complex mental processes begin as social activities and gradually evolve into internal mental activities that children can use independently.* Vygotsky proposed that many complex thought processes have their roots in social interactions. As children discuss objects, events, tasks, and problems with adults and other knowledgeable individuals (e.g., older siblings), they gradually incorporate into their own thinking the ways in which the people around them talk about and interpret the world, and they begin to use the words, concepts, symbols, and strategies—in essence, the cognitive tools—that are commonly used in their culture. The process through which social activities evolve into internal mental activities is called **internalization**. The progression from self-talk to inner speech just described illustrates this process: Over time, children gradually internalize adults' directions so that they are eventually giving *themselves* the directions.

  Not all mental processes emerge as children interact with adults; some instead develop as children interact with their peers. For example, children frequently argue with one another about a variety of matters—what games to play, who did what to whom, and so on. According to Vygotsky, having arguments helps children discover that there are often several ways to view the same situation. Eventually, he suggested, children internalize the arguing process, developing the ability to look at a situation from a variety of angles *on their own*.

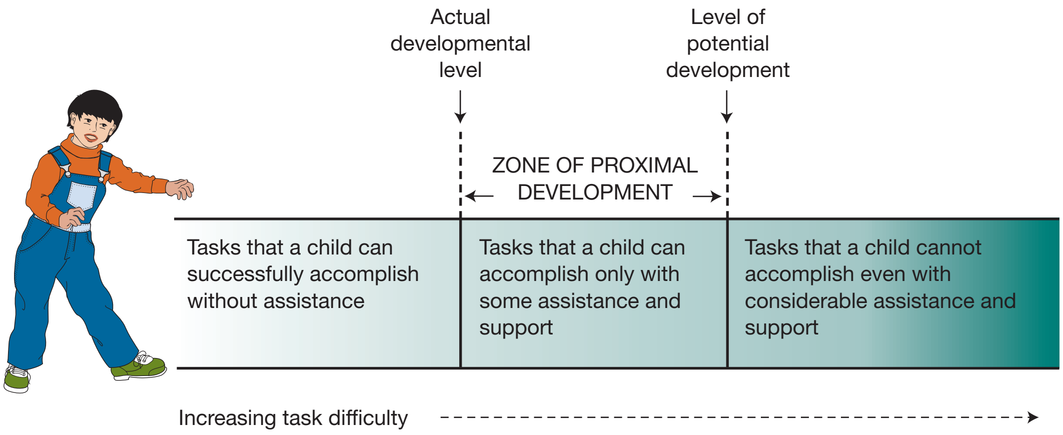
Chapter 8 more fully describes the nature and development of children's ability to regulate their own behavior and thinking processes.

- *Children appropriate their culture's tools in their own idiosyncratic manner.* Children don't necessarily internalize *exactly* what they see and hear in a social context; rather, they often transform ideas, strategies, and other cognitive tools to suit their own needs and purposes—thus, Vygotsky's theory has a constructivist element to it. The term **appropriation** is often used to refer to this process of internalizing but also for adapting the ideas and strategies of one's culture for one's own use.
- *Children can accomplish more difficult tasks when assisted by more advanced and competent individuals.* Vygotsky distinguished between two kinds of abilities that characterize children's skills at any particular point in development. A child's **actual developmental level** is the upper limit of tasks that they can perform independently, without help from anyone else. A child's **level of potential development** is the upper limit of tasks that they can perform with the assistance of a more competent individual. To get a true sense of children's cognitive development, Vygotsky suggested, we should assess their capabilities not only when performing alone but also when performing with assistance—a strategy that contemporary educators call *dynamic assessment*.

  As mentioned earlier, Vygotsky found that children can typically do more difficult things in collaboration with adults than they can do on their own. For example, they can play more challenging piano pieces when an adult helps them locate some of the notes on the keyboard or provides suggestions about which fingers to use where. They can solve more difficult math problems when their teacher helps them identify critical problem components and potentially fruitful problem-solving strategies. And they can often read more complex prose in a reading group at school than they're likely to read independently at home. Research also suggests that whereas children can learn more complex information when they are helped by adults, they understand that some adults will be more effective at helping them than others (Sobel & Finiasz, 2020).

Chapter 14 provides more details about dynamic assessment.

Figure 2.9 In Vygotsky's view, tasks in a child's zone of proximal development promote maximal learning and cognitive growth.


Actual developmental level
Level of potential development
ZONE OF PROXIMAL DEVELOPMENT
Tasks that a child can successfully accomplish without assistance
Tasks that a child can accomplish only with some assistance and support
Tasks that a child cannot accomplish even with considerable assistance and support
Increasing task difficulty

- *Challenging tasks promote maximum cognitive growth.* The range of tasks that children cannot yet perform independently but *can* perform with the help and guidance of others is, in Vygotsky's terminology, the **zone of proximal development (ZPD)** (see Figure 2.9). A child's zone of proximal development includes learning and problem-solving abilities that are just beginning to emerge and develop.

Give students sufficient guidance to enable them to successfully accomplish difficult tasks.

  Vygotsky proposed that children learn very little from performing tasks they can already do independently. Instead, they gain new skills primarily by attempting tasks they can accomplish only with assistance and support—that is, when they attempt tasks within their zone of proximal development. Thus, it's the challenges in life, *not* the easy successes, that promote cognitive development. But whereas challenging tasks are beneficial, impossible tasks that children can't do even with considerable structure and guidance are of no benefit whatsoever (Vygotsky, 1987). For example, it would be pointless to ask most 5-year-olds to solve for x in an algebraic equation. In general, a child's ZPD sets a limit on what they are cognitively capable of learning.

  As teachers, then, we should assign some tasks that students can accomplish successfully *only* with some support In some instances, this support must come from us or other, more skilled individuals. In other situations, students of equal ability might work together to jointly accomplish difficult assignments, with each student bringing unique strengths to contribute to the overall effort. And in some cases, carefully selected technological resources may provide the support needed to guide students through a complex task. But we must make sure that they get that extra support, or they will become frustrated, and their motivation toward the task may suffer (we will discuss this in Chapter 11). As students acquire the ability to independently perform complex tasks, they will start to engage in deliberate practice of the skills involved in those tasks, particularly during the early elementary school years (Coffman et al, 2019).

  Regardless of the nature of the support we provide, we must remember that every student's ZPD will change over time. As some tasks are mastered, other, more complex ones will appear on the horizon to take their place. In addition, students' ZPDs may vary considerably in "width." Some students may, with assistance, be able to stretch several years above their actual (independent) developmental level; others may be able to handle tasks that are only slightly more difficult than what they can currently do on their own. In some instances, students with different ZPDs will need individualized tasks and assignments so that they all have challenges that optimally promote their personal cognitive growth.

- *Play allows children to cognitively "stretch" themselves.* Children love to play, whether it's in school or at home. Vygotsky noted that play serves an important role in children's cognitive development (Vygotsky, 1987). Whereas some teachers are anxious about allowing children to have too much free time because of potential misbehavior, letting children have time for unstructured play provides them with the opportunity to engage in enjoyable activities that promote cognitive development (Parrott & Cohen, 2020). For example, during a very long international flight, parents allowed their 2-year-old daughter to pretend to be a flight attendant (and fortunately the nearby passengers were amused by this). The child had a toy tea set, and she walked down the aisle and offered tea to passengers. The child attempted to ask passengers if they wanted tea, and if the passenger said yes, the child would pretend to pour tea into a plastic teacup.

By pretending to be a flight attendant, this child had the opportunity to practice a variety of adult-like behaviors. In real life, such a scenario would be virtually impossible: Very few 2-year-olds have the skills necessary to be a flight attendant. Yet the element of make-believe provided this child with the opportunity to engage in several grown-up behaviors. In Vygotsky's words, "In play a child always behaves beyond his average age, above his daily behavior; in play it is as though he were a head taller than himself" (Vygotsky, 1978, p. 102).

Give students time to explore new activities and roles through play.

As children play, their behaviors must conform to certain standards or expectations. In the early elementary school years, children often act in accordance with how a parent or teacher would behave. In the organized group games and sports that come later, children must follow specific sets of rules. By adhering to such restrictions on their behavior, children learn to plan ahead, to think before they act, and to engage in self-restraint—skills critical for successful participation in the adult world (also see Coplan & Arbeau, 2009; A. Diamond et al., 2007; Lillard, 2017; Pellegrini, 2009).

Play, then, is hardly a waste of time. Instead, it provides a valuable training ground for the adult world. Perhaps for this reason it's seen in children worldwide.

Critiquing Vygotsky's Theory

Vygotsky focused more on the processes through which children develop than on the characteristics that children of particular ages are likely to exhibit. He described stages of development but portrayed them in only the most general terms (e.g., see Vygotsky, 1997, pp. 214–216). In addition, Vygotsky's descriptions of developmental processes were often vague and speculative (Gauvain, 2001; Haenan, 1996; Moran & John-Steiner, 2003). For such reasons, Vygotsky's theory has been difficult for researchers to test and either verify or disprove.

Nevertheless, contemporary theorists and educators have found Vygotsky's ideas insightful and helpful (Portes, Salas, 2011; Glassman et al., 2022). Most significantly, his theory points out the many ways in which *culture* influences cognitive development. A society's culture ensures that each new generation benefits from the accumulating wisdom of preceding generations. Any culture guides children in certain directions by encouraging them to pay attention to particular stimuli (and not to others) and to engage in particular activities (and not in others). In addition, it provides a lens through which children come to view and interpret their experiences in culturally appropriate ways. We see obvious effects of culture in many of children's everyday activities—in the books they read, the roles they enact in pretend play, the extracurricular activities they pursue—but we must remember that culture permeates their unobservable thinking processes as well. When children come to school, keep in mind that from a Vygotskian perspective, their thought processes have been shaped by their cultures. Thus, some students may experience difficulties at school because their thought processes have been shaped by interactions and traditions that may not be aligned with the practices of the school in which you teach.

Furthermore, some research has supported Vygotsky's views regarding the progression and role of self-talk and inner speech. The frequency of children's audible self-talk decreases during the preschool and early elementary years, but this decrease is at first accompanied by an increase in whispered mumbling and silent lip movements, presumably reflecting a transition to inner speech (Bivens & Berk, 1990; Winsler & Naglieri, 2003). Self-talk increases when children are performing more challenging tasks, at which they must exert considerable effort to be successful (Berk, 1994; Schimmoeller, 1998). As you undoubtedly know from your own experience, even adults occasionally talk to themselves when they face new challenges. Self-talk can be particularly beneficial in sports—adults and adolescents who engage in positive self-talk can actually enhance their performance! (Tod et al., 2011).

Considering Diversity from the Perspective of Vygotsky's Theory

Vygotsky's theory leads us to expect greater diversity in cognitive development among children and adolescents than Piaget's theory does. As we've seen, children in any single age group are apt to have different zones of proximal development: Tasks that are easy for some children may be quite challenging or virtually impossible for others. In addition, to the extent that specific cultural groups pass along unique concepts, ideas, and beliefs, children from different cultural backgrounds will acquire somewhat different knowledge, skills, and ways of thinking. For instance, children are more likely to acquire map-reading skills if they regularly encounter maps (e.g., of roads, subway systems, shopping malls) in their community and family life (Liben & Myers, 2007).

Contemporary Extensions and Applications of Vygotsky's Theory

The Into the Classroom feature "Applying Vygotsky's Theory" presents concrete examples of how teachers might make use of Vygotsky's ideas. In the upcoming sections, we'll consider several ways in which contemporary theorists and educators have built on the foundations that Vygotsky laid.

Social Construction of Meaning Although children often feel that they are perfectly capable of learning new skills independently (Richardson et al., 2021), an adult will help a child make sense of the world through a joint discussion of a phenomenon or event they are both experiencing (Feuerstein et al., 2010; Murphy et al., 2011). Such an interaction, sometimes called a **mediated learning experience**, encourages the child to think about the phenomenon or event in particular ways—to attach labels to it, recognize principles that underlie it, draw certain conclusions from it, and so on. As an example, consider the following exchange, in which a 5-year-old boy and his mother are talking about a prehistoric animal exhibit at a natural history museum.

> ***Boy:*** Cool. Wow, look. Look giant teeth. Mom, look at his giant teeth.
>
> ***Mom:*** He looks like a saber tooth. Do you think he eats meat or plants?
>
> ***Boy:*** Mom, look at his giant little tooth, look at his teeth in his mouth, so big.
>
> ***Mom:*** He looks like a saber tooth, doesn't he? Do you think he eats plants or meat?
>
> ***Boy:*** Ouch, ouch, ouch, ouch. (referring to sharp tooth)
>
> ***Mom:*** Do you think he eats plants or meat?
>
> ***Boy:*** Meat.
>
> ***Mom:*** How come?
>
> ***Boy:*** Because he has sharp teeth. (growling noises) (Ash, 2002, p. 378)

Into The Classroom

Applying Vygotsky's Theory

- **Provide cognitive tools that students can use in thinking about and tackling new tasks.**

  A high school chemistry teacher places three equal-size inflated balloons into three beakers of water, one heated to almost 100°C, one kept at room temperature, and one containing recently melted ice. The students all agree that the balloon placed in the warmest water expands the most. The teacher then introduces Charles's Law as a means of determining how much the volume of a gaseous substance, such as air, will change as its temperature changes.

- **Encourage students to talk themselves through difficult tasks.**

  As his students work on complex mathematical equations such as this one

  $$x = \frac{2(4 \times 9)^2}{6} + 3$$

  a middle school mathematics teacher gives students a mnemonic (**P**lease **e**xcuse **m**y **d**ear **A**unt **S**ally) they might repeat to themselves while solving problems of this nature, to help them remember the order in which they should perform various operations (**p**arentheses, **e**xponents, **m**ultiplication and **d**ivision, **a**ddition and **s**ubtraction).

- **Present some tasks that students can perform successfully only with assistance.**

  When a fifth-grade teacher assigns students their first research paper, he breaks the process into several discrete steps and provides a great deal of structure and guidance at each step.

- **Provide sufficient support, or scaffolding, to enable students to perform challenging tasks successfully; gradually withdraw the support as they become more proficient.**

  An elementary physical education teacher begins a lesson on tumbling by demonstrating forward rolls in slow motion and physically guiding her students through the correct movements. As the students become more skillful, the teacher stands back from the mat and gives verbal feedback about how to improve.

- **Have students work in small groups to accomplish complex, multifaceted tasks.**

  A middle school art teacher asks his students to work in groups of four or five to design and then produce some large murals that depict various ecosystems—rainforest, freshwater wetland, prairie, desert, and tundra—and the kinds of plant and animal species that live in each one.

- **Give young children time to practice adult roles and behaviors through play.**

  A kindergarten teacher equips his classroom with many household items (e.g., dress-up clothes, cooking utensils, a toy cell phone) so that students can play house during free-play time.

Even without his mother's assistance, the boy would almost certainly have learned something about saber-tooth tigers from his museum visit. Yet Mom helps him make better sense of what he is looking at than he might have done on his own—for instance, by using the label *saber tooth* and helping him connect tooth characteristics to eating preferences. Notice how persistent Mom is in asking her son to make the tooth–food connection: She continues to ask him about meat versus plants until the boy finally correctly infers that the tigers must have been meat eaters.

In addition to co-constructing meanings with adults, children and adolescents often talk among themselves to make sense of their experiences. School provides an ideal setting in which young people can toss around ideas and perhaps reach consensus about how best to interpret and understand a complex issue or problem—perhaps about a challenging math problem, troubling interpersonal dynamics with peers, or moral dilemmas that have no easy right or wrong answers.

Interacting with adults and interacting with peers possibly play somewhat different roles in children's development. Adults usually have more experience and expertise than age-mates do, and they tend to be more skillful teachers. Accordingly, adults are often the partners of choice when children are trying to master complex new tasks and procedures (Gauvain, 2001; Radziszewska & Rogoff, 1988). Working with peers has a different set of advantages. First, as mentioned in the earlier discussion of Piaget's theory, children who hear their peers express perspectives quite different from their own may experience sociocognitive conflict that motivates them to reassess their own understandings. Second, as Vygotsky suggested, peer interactions provide a social context in which children practice and eventually internalize complex cognitive processes, such as effective reading comprehension and argumentation skills (Andriessen, 2006; Chinn et al., 2001; Larrain et al., 2019; Murphy et al., 2011). A third benefit is that children learn valuable social behaviors—including how to plan a collaborative project and how to coordinate differing roles—when they work on cognitive tasks with their peers (Gauvain, 2001).

Getting Your Students into the Zone of Proximal Development. Vygotsky noted that children are likely to learn more and to experience cognitive growth when they work on various tasks with the support of someone who is more competent at the task (e.g., an adult, an older sibling, a classmate who has mastered the task). When this type of collaboration occurs, students are operating in the zone of proximal development. But realistically, how can a teacher get students to operate in the zone of proximal development?

There are several different ways that we can accomplish this. The process of a more competent individual guiding a student through a complex task is referred to as **scaffolding**. Here are some examples of how classroom teachers can provide scaffolding:

- Demonstrate correct performance in a manner that students can easily imitate.
- Divide a complex task into several smaller, simpler activities.
- Provide a structure or set of guidelines for accomplishing the task.
- Provide a calculator, software (word processing program, spreadsheet, etc.), or other technology that makes some aspects of the task easier.
- Keep students' attention focused on critical aspects of the task.
- Ask questions or give hints that encourage students to think about the task in productive ways.
- Give frequent feedback about how students are progressing. (Collins, 2006; Gallimore & Tharp, 1990; Jordan, 2015; Rogoff, 1990; van de Pol et al., 2010; Wood et al., 1976)

Depending on their particular knowledge and ability levels, different students in any single grade may need different kinds of scaffolding to support their success in a task. As students become more adept at performing a new task, scaffolding is ideally modified to nurture newly emerging skills. And over time the scaffolding can gradually be phased out—a process known as *fading*—until students can complete the task entirely on their own. In fact, providing *too much* scaffolding—more than students need—can overwhelm and distract them (van Merriënboer & Sweller, 2005).

Guided Participation in Challenging New Activities When you were a young child, did you sometimes help a parent or older sibling bake cookies or other goodies? Did the cook let you pour, measure, and mix ingredients when you were old enough to do so? Did the cook also give you directions or suggestions as you performed these tasks? Such experiences are examples of **guided participation**, in which children gain new skills by working on complex, meaningful tasks in close, scaffolded collaboration with an adult or more experienced peer. As children acquire greater competence, they gradually take a more central role in an activity until, eventually, they're full-fledged participants (Rogoff, 2003; Rogoff et al., 2007). From a Vygotskian perspective, guided participation enables children to engage in behaviors and thinking skills within their zone of proximal development. It also helps children tie newly acquired skills and thinking abilities to the specific contexts in which they're likely to be useful later on.

A concept very similar to *guided participation* is *legitimate peripheral participation* discussed in Chapter 8.

Guided participation can take many forms in instructional settings. For instance, we might get students involved in scientific investigations, throwing a pot, or focused Internet searches, while always providing the guidance and support students need to accomplish such tasks successfully. As we engage students in these activities, we might also use some of the language that adults frequently use in such contexts. For example, when conducting scientific investigations with students, we should use such words as *hypothesis, evidence,* and *theory* as we go along (Perkins, 1992).

Apprenticeships An especially intensive form of guided participation is an **apprenticeship**, in which a novice works with an expert mentor for a lengthy period to learn how to perform many complex tasks within a particular domain. The expert provides considerable structure and guidance throughout the process, gradually removing scaffolding and giving the novice more independence and responsibility as competence increases (Collins, 2006; Rogoff, 1990, 1991). Many cultures use apprenticeships as a means of gradually introducing children to particular skills and trades in the adult community—perhaps weaving, tailoring, or playing a musical instrument (Elliott, 1995; Lave & Wenger, 1991; Rogoff, 1990).

In a good apprenticeship, a student learns not only how to perform a task but also how to productively *think about* the task—a situation known as a **cognitive apprenticeship** (Brown et al., 1989; A. Collins, 2006; Dennen & Burner, 2008). For instance, a student might work with a farmer to learn how to grow crops, or a student might work with an experienced carpenter to design and build a kitchen cabinet. In the process of talking about various aspects of the task, the expert and student together analyze the problem at hand and develop the best approach to take, and the expert models effective ways of thinking about and mentally processing the situation.

Apprenticeships differ widely from one context to another, but they typically have some or all of the following features (Collins, 2006; Collins et al., 1989):

- *Modeling:* The mentor carries out the task, simultaneously thinking aloud about the process, while the learner observes and listens.
- *Coaching:* As the learner performs the task, the mentor gives frequent suggestions, hints, and feedback.
- *Scaffolding:* The mentor provides various forms of support for the learner, perhaps by simplifying the task, breaking it into smaller and more manageable components, or providing less complicated equipment.
- *Articulation:* The learner explains what they are doing and why, allowing the mentor to examine the student's knowledge, reasoning, and problem-solving strategies.
- *Reflection:* The mentor asks the learner to compare their performance with that of experts, or perhaps with an ideal model of how the task should be done.
- *Increasing complexity and diversity of tasks:* As the learner gains greater proficiency, the mentor presents more complex, challenging, and varied tasks to complete.
- *Exploration:* The mentor encourages the learner to frame questions and problems on their own, and in doing so to expand and refine acquired skills.

Give prompts that get students thinking about a complex task as an expert might.

Apprenticeships are clearly labor intensive and may not be practical for everyday classroom application. We certainly use some elements of an apprenticeship to help students develop more complex skills. For example, we might help students think about writing tasks in the same ways that expert writers do by providing such prompts as "To liven this up, I'll . . . " and "I can tie this together by . . . ." Prompts like these provide the same sort of scaffolding that an expert writer might provide, and they help students develop more sophisticated writing strategies (Benton, 1997; Scardamalia & Bereiter, 1985; Wong et al., 2008). It is also possible in middle schools and high schools to provide students with opportunities to participate in brief apprenticeships in the community.

Contrasting Piaget's and Vygotsky's Theories

Both Piaget and Vygotsky have had a profound influence on contemporary views of learning, thinking, and cognitive development. If we look beyond their differing terminologies, we can see some common themes in the two perspectives. First, both theorists suggested that children acquire increasingly complex thinking processes with age and experience. Second, both argued for the importance of challenge, perhaps in the form of puzzling new information (Piaget's *disequilibrium*) or perhaps in the form of tasks that can be completed only with another person's support (Vygotsky's *zone of proximal development*). And third, at any given point in development, children are cognitively ready for some experiences but not for others. In Piaget's view, a child can accommodate to new objects and events only when they can, to some degree, also assimilate them into existing schemes—that is, there must be some overlap between the "new" and the "old." From Vygotsky's perspective, some challenging new tasks may fall within a child's ZPD—and thus be accomplishable with guidance and support—but other tasks are likely to be out of reach for the time being.

Nevertheless, Piaget's and Vygotsky's theories differ in significant ways. For one thing, Piaget maintained that children's cognitive development is largely the result of their own efforts—for instance, their informal experiments with physical objects and their attempts to restore equilibrium in the face of puzzling events. In contrast, Vygotsky placed considerable emphasis on the role of adults and other, more advanced individuals, who can mediate new experiences and provide needed support during challenging activities. The difference, then, is one of self-exploration and discovery (Piaget) versus guided exploration and instruction (Vygotsky).

A second key difference lies in the potential influence of the culture in which children grow up. Piaget recognized that cultural differences might have an effect, but he didn't systematically consider them in children's thinking processes. For Vygotsky, however, culture is of paramount importance in molding the specific thinking skills children acquire—a perspective that Bronfenbrenner echoed in describing the multiple layers of environmental influence on children's development. Increasingly, contemporary researchers have come to the same conclusion: Children's cultural environments can have a *huge* influence on what they learn and how they develop.

Chapter 4 describes a variety of cultural and ethnic differences that can shape children's behaviors and development.

Finally, the two theorists offer differing perspectives on how language enters into the picture. For Piaget, language certainly enhances cognitive development: It provides many labels (*symbols*) that help children mentally represent their world, and it's the primary means through which children gain knowledge of other people's diverse perspectives on various situations and topics. For Vygotsky, however, language is absolutely essential for cognitive growth. Children's thought processes are internalized versions of social interactions that are largely verbal in nature. Furthermore, in their conversations with adults, children learn the meanings their culture ascribes to particular events and gradually begin to interpret the world in culture-specific ways. In addition, through two language-based phenomena—self-talk and inner speech—children begin to guide their own behaviors in ways that others have previously done.

Nevertheless, Piaget's and Vygotsky's theories are not incompatible. We don't want you to finish this chapter and feel that as a teacher, you can only adopt either a Piagetian or a Vygotskian perspective. As a teacher you can, in many ways, incorporate aspects of both theories. Consider the activity displayed in Figure 2.10 In this activity, students match written words with pictures. Think about how this activity could be approached from either a Piagetian or a Vygotskian perspective. From a Piagtian perspective, a teacher might ask students to first sort the words into alphabetical order (a task that would be appropriate perhaps for some preoperational children and certainly for children who are at the stage of concrete operations), or perhaps to sort the words into categories such a colors, living organisms, etc.) (a task that would only be appropriate for students in the concrete operational stage). But it's also possible for a teacher to think about this activity in Vygotskian terms. For example, third graders could be partnered with sixth graders to put the words into categories. The sixth graders would serve as the more advanced partner helping the third grader to operate in the zone of proximal development and come up with meaningful groupings that the younger student could not have accomplished alone.

Figure 2.10 Word sorting activity

MOON
HORSE
RED
HAT
YELLOW
FISH
BLUE

VCoscaron/Shutterstock

SOURCE: https://www.softschools.com/social_studies/words/games/extreme_weather_abcsort4798.html

Language Development

Learning Objective 2.5 Describe developmental changes in language during the school years and explain how you might adapt instruction to children with diverse linguistic abilities and needs.

Many contemporary theorists share Piaget's and Vygotsky's belief that acquiring language is an important—perhaps the *most* important—factor in cognitive development (e.g., Newcombe, 2017; Pinker, 2007; Premack, 2004; Spelke, 2003). Broadly, there are two aspects of cognitive processes that undergird language development. First, language *comprehension* refers to both the auditory processing of language (i.e., hearing language), and the decoding of language (i.e., attaching meaning to words, sentences, and concepts). Second, *language processing* refers to the processes that the brain uses to understand language within the broader contexts of conversations (Owens, 2020).

Acquiring the language of one's culture is an extremely complex and challenging undertaking. To understand and use a language effectively, children must master four basic components of the language. First, they must master their language's *phonology:* They must know how words sound and be able to produce the sequence of sounds that make up any given word. Second, they must master *semantics,* the meanings of many thousands of words. Third, they must have a good command of *syntax,* knowing how words can legitimately be combined to form understandable phrases and sentences. And finally, children must master the *pragmatics* of their language—the social conventions and speaking strategies that enable effective communication with others.

Mastering these four components of language is a remarkable achievement for any child, yet before children reach kindergarten, most of them have acquired sufficient proficiency in language to carry on productive conversations with the people around them. Their language development continues throughout childhood and adolescence, in part as a result of informal social interactions and in part as a result of formal instruction (see Table 2.2).

Some aspects of language development during the school years reflect an increasing ability to think abstractly about physical and social phenomena. For example, abstract thought enables children to reflect, deliberately and consciously, on the general nature and functions of language—an acquisition known as **metalinguistic awareness**

DEVELOPMENTAL TRENDS

Table 2.2 Examples of Linguistic Characteristics and Abilities at Different Grade Levels

Grade Level	Age-Typical Characteristics	Example	Suggested Strategies
K–2	• Knowledge of 8,000–14,000 words by age 6; understandings of some words only partially correct • Difficulty understanding lengthy, complex sentences • Superficial understanding of being a "good listener" • Literal interpretations of messages and requests • Increasing ability to tell a story, both orally and in writing • Occasional use of regular word endings (*-s, -ed, -er*) with irregular words (*sheeps, goed, gooder*) • Basic etiquette in conversations (e.g., taking turns, answering questions)	When two police officers visit a first-grade class to talk about how to go to and from school safely each day, the students listen quietly and respectfully. After the visit, however, the students can recall very little about what the officers have told them.	🍏 Read age-appropriate storybooks to enhance vocabulary. 🍏 Give gentle corrective feedback when students misuse words. 🍏 Work on listening skills. 🍏 Ask follow-up questions to make sure students accurately understand important messages. 🍏 Ask students to construct narratives about recent events (e.g., "Tell me about your camping trip last weekend").
3–5	• Incomplete knowledge of irregular word forms • Sustained conversations about concrete topics • Increasing ability to take listeners' prior knowledge into account during explanations • Construction of stories with plots and cause-and-effect relationships • Linguistic creativity and word play (e.g., rhymes, word games)	Students in a third-grade class love corny jokes and riddles that involve a play on words. For example, many are amused by "Why did the cookie go to the doctor?" ("He felt crumby")	🍏 Explicitly teach irregular word forms. 🍏 Incorporate group discussions and story-telling (and writing) in lessons. 🍏 Encourage jokes and rhymes that capitalize on double meanings and homonyms (i.e., sound-alike words). 🍏 Consult with a speech-language specialist if articulation problems persist in the upper elementary grades.
6–8	• Increasing knowledge of words used in particular academic disciplines • Emerging ability to look beyond literal interpretations; e.g., simple proverbs, sarcasm • Increasing metalinguistic awareness; that is, ability to reflect on the underlying nature of language • Increasing proficiency in expository (nonfiction) writing, especially with teacher scaffolding	Students in a sixth-grade class write better persuasive essays when their teacher gives them explicit guidance about elements to include, including expressing one's opinion, providing supporting evidence, and adding other potential opinions and reasons why those are invalid.	🍏 Continue introducing new vocabulary, including terminology used in specific content areas. 🍏 Conduct structured debates to explore controversial issues. 🍏 Ask students to consider the underlying meanings of common proverbs. 🍏 Explore the nature of words and language as entities in and of themselves. 🍏 Frequently ask students to write about topics, providing guidance about effective writing and frequent feedback about what students have written.
9–12	• Acquisition of many vocabulary words related to particular academic disciplines • Subtle refinements in syntax, mostly as a result of formal instruction • General ability to understand figurative language (e.g., metaphors, proverbs, hyperbole) • Significant improvements in expository writing, especially with experience and constructive feedback	When a ninth-grade class reads Robert Frost's poem "The Road Not Taken," most students realize that, at a deeper level, the poem is about choosing among various paths in life.	🍏 Regularly use the terminologies associated with various academic disciplines. 🍏 Distinguish between similar abstract words (e.g., *weather* vs. *climate*). 🍏 Explore complex syntactic structures. 🍏 Consider the underlying meanings and messages in poetry and fiction. 🍏 When students have a native dialect other than Standard English, encourage them to use it in informal conversations and creative writing; encourage Standard English for more formal situations.

SOURCE: Adger et al., 2007; Byrnes, 1996; Capelli et al., 1990; Carey, 1978, 1985; Ferretti et al., 2000; Grant & Gomez, 2001; Harris et al., 2006; Harris et al., 2010; Karmiloff-Smith, 1979; Maratsos, 1998; McDevitt & Ford, 1987; McDevitt et al., 1990; Nippold, 1988; O'Grady, 1997; Owens, 2020; Reich, 1986; Stanovich, 2000.

(Owens, 2008; Yaden & Templeton, 1986). With such awareness comes an ability to recognize the figurative nature of words—the nonliteral meanings of proverbs, the symbolism in poems and literature, and so on. At the same time, children's ever-expanding language capabilities probably also *help* them think abstractly (Nelson, 1996; Pinker, 2007), and they become better able to write stories, poems, and nonfiction. In addition, language development affects other cognitive processes, such as mathematical skills. For example, children's phonological skills are related to their subsequent mathematical computational skills, and their understanding of the meanings of words is related to their subsequent ability to solve word problems (Singer et al., 2019).

Theoretical Issues Regarding Language Development

Children's immediate environments play a significant role in their language development. The richer the language that children hear—that is, the greater the variety of words and the greater the complexity of syntactic structures to which other people expose them—the faster their vocabulary develops (Hoff, 2003; Jones & Rowland, 2017; Raikes et al., 2006; Risley & Hart, 2006). Yet children don't simply absorb the language spoken around them; instead, they appear to use what they hear to construct their own understandings of the language, including knowledge about word meanings, rules governing how words can be combined into sentences, and so on (Cairns, 1996; Cromer, 1987; Karmiloff-Smith, 1993). Thus, we see in language development some of the knowledge *construction* of which Piaget spoke.

Most developmental theorists agree that heredity is also involved in language development to some degree. Human beings have the capacity to acquire a far more complex language than any other species on the planet. Exactly *what* human beings inherit that enables them to learn language is a matter of considerable controversy, however. At a minimum, infants inherit a few key predispositions—for instance, a preference for human voices over other sounds and an ability to hear very subtle differences among speech sounds—that make language learning possible (DeCasper & Fifer, 1980; Jusczyk, 1995; Kuhl, 2004; Locke, 1993). In addition, some theorists believe that part of our genetic heritage is a *language acquisition device,* a language-specific learning mechanism (also referred to as *universal grammar*), that enables infants and toddlers to acquire many intricacies of language in an amazingly short amount of time (Chomsky, 1972, 2006; Gopnik, 1997; Karmiloff-Smith, 1993). Other theorists believe that universal rules of grammar do not exist. Rather, children learn language in much the same way they learn other things about their environment and culture: through detecting and making use of regular patterns of input from their social environment (Gentner & Namy, 2006; Owens, 2020; Pelucchi et al., 2009; Saffran, 2003).

Some research evidence does point to a language-specific developmental mechanism for at least *some* aspects of language learning (Lai et al., 2001; Maratsos, 1998; Trout, 2003). Children of all cultures learn language very quickly and acquire complex syntactic structures even when those structures aren't necessary for effective communication. In addition, brain research reveals that certain parts of the left hemisphere seem to be biologically predisposed to specialize in either understanding or producing speech (Aitchison, 1996; Locke, 1993).

Additional evidence for heredity's influence comes from research findings suggesting that there may be *sensitive periods* in some aspects of language development. Children who have little or no exposure to *any* language in the early years often have trouble acquiring complex language later on, even with intensive language instruction (Newport, 1990), although if intervention occurs before the age of 3, language development can still be improved (Windsor et al., 2007). Furthermore, when learning a *second* language, people have an easier time mastering correct pronunciations, various verb tenses, and complex grammatical structures if they're immersed in the language during childhood or early adolescence (Bialystok, 1994;

Bortfeld & Whitehurst, 2001; Bruer, 1999; Thomas & Johnson, 2008). Possibly such sensitive periods reflect biologically built-in time frames for learning language. Alternatively, perhaps what appear to be predetermined "best" times for learning particular aspects of language are simply the result of the brain's tendency to adapt fairly quickly to whatever forms its early auditory environment takes (Kuhl, 2004; Kuhl et al., 2005).

Diversity in Language Development

Some diversity in language development seems to be the result of biology. For instance, children with a **specific language impairment** develop normally in all respects except for language. These children have trouble perceiving and mentally processing particular aspects of spoken language—perhaps the quality, pitch, duration, or intensity of specific speech sounds. Often, although not always, the source of the impairment can be traced to heredity or a specific brain abnormality (Bishop, 2006; Bishop et al., 2009; Corriveau et al., 2007; Spinath et al., 2004).

Cultural factors play a role in linguistic diversity as well. For example, different cultural groups may nurture different *dialects*—distinct forms of a language that characterize particular ethnic groups or geographic regions—and different social conventions for human conversation (i.e., different pragmatic skills; Adger et al., 2007; Kitayama & Cohen, 2007; Tyler et al., 2008). Culture also is related to exposure to language—in some cultures, linguistic interactions with young children may be less common than in others (e.g., Weber et al., 2017). Occasionally, a cultural or ethnic group specifically nurtures certain aspects of language development. For example, many inner-city African American communities make heavy use of figurative language—such as similes, metaphors, and *hyperbole* (intentional exaggeration)—in their day-to-day conversations, jokes, and stories (Lee, 2005; Smith, 1998; Smitherman, 2007). The following anecdote illustrates this point:

Chapter 4 looks more closely at the nature and implications of children's dialects.

> I once asked my mother, upon her arrival from church, "Mom, was it a good sermon?" To which she replied, "Son, by the time the minister finished preaching, the men were crying and the women had passed out on the floor." (Smith, 1998, p. 202)

With such a rich oral tradition, it isn't surprising that many inner-city African American youth are especially advanced in their use and understanding of figurative language (Ortony et al., 1985; Smith, 1998; Smitherman, 2007).

Second-Language Learning and English Language Learners

As mentioned earlier, exposure to a second language in childhood or early adolescence may be especially important for acquiring flawless pronunciation and certain aspects of syntax. Early exposure to a second language seems to be most advantageous if the second language is very different from the first. For example, a native English speaker benefits more from an early start in Arabic or Navajo than from an early start in, say, Spanish or German (Bialystok, 1994; Strozer, 1994). Aside from such caveats, there appears to be no definitive "best" time to begin studying a second language (e.g., Kuhl et al., 2005; Stevens, 2004).

Yet beginning second-language instruction in the early years has other noteworthy advantages (Byers-Heinlein & Lew-Williams, 2013). For one thing, it appears that learning a second language facilitates achievement in other academic areas such as reading, vocabulary, and grammar (Diaz, 1983; Reich, 1986). Instruction in a foreign language also sensitizes young children to the international and multicultural nature of the world. Students who learn a second language during the elementary school years express more positive attitudes toward people who speak that language and are more likely to enroll in foreign language classes in high school (Reich, 1986).

Support opportunities for students of all ages to learn one or more foreign languages.

Bilingualism At least half of the world's children are *bilingual*—that is, they speak at least two languages fluently (Hoff-Ginsberg, 1997). Speaking more than one language is quite typical in much of the world, although not as typical in the United States (Diamond, 2010). Although children who grow up in bilingual environments may initially have more limited vocabularies in each language, research suggests that there may be long-term advantages to bilingualism (Bialystok, 2017; Timmer et al., 2017). Bilingual children appear to have a head start in their development of metalinguistic awareness (Adesope et al., 2010; Bialystok, 2001). For instance, in the early elementary grades, bilingual children have greater **phonological awareness**—awareness of the individual sounds, or *phonemes,* that make up spoken words—and this awareness can get them off to an especially good start in learning to read (Chen et al., 2004; Rayner et al., 2001; Reljić et al., 2015). Furthermore, when children are truly fluent in both languages, they tend to perform better on tasks requiring focused attention and on tasks requiring flexible, creative thinking (Adesope et al., 2010; Bialystok et al., 2009). Their superior performance on such tasks may be partly the result of enhanced development in certain areas of the brain (Espinosa, 2008; Mechelli et al., 2004). Moreover, there is some evidence that bilingualism leads to slightly improved working memory (i.e., the ability to keep small bits of newly acquired information active in one's thoughts for brief periods of time; see Chapter 7) (Grundy & Timmer, 2017). Despite these advantages, to the extent that elementary and secondary school students have limited knowledge of English, they are apt to have trouble with schoolwork in an English-based classroom (Kieffer, 2008; Padilla, 2006; Slavin & Cheung, 2005; Valdés et al., 2005).

The number of bilingual students in the United States has been steadily increasing in recent years, with the greatest proportion of bilingual students speaking Spanish as their second language, followed by Arabic. The largest proportion of students who are bilingual live in urban settings rather than in suburban and rural regions (National Center for Education Statistics, 2022). There also are large numbers of students who do not speak English as their primary language in other English-speaking countries. For example, 19.5% of students in England speak a language other than English as their primary language (Clark, 2022).

Being bilingual can have cultural and social advantages as well. In any English-speaking country, mastery of spoken and written English is, of course, essential for long-term educational and professional success. But when a resident of that country belongs to a cultural group that speaks a different language, maintaining social relationships within the culture requires knowledge of its language (McBrien, 2005a). For instance, Puerto Rican children in the United States often speak Spanish at home as a way of showing respect to their elders (Torres-Guzmán, 1998). Furthermore, in some immigrant families, school-age children may be the most fluent English speakers in their families and they serve an important role in supporting their family members' interactions with the community. Finally, at school, when different students in a single classroom each speak only one of two different languages (perhaps some speaking only English and others speaking only Spanish), teaching students both languages increases student interaction and cross-cultural understanding (Doyle, 1982; Padilla, 2006).

When teachers acknowledge and appreciate the fact that students are bilingual, the students experience social and cognitive benefits. Students may feel more comfortable using the second language both in the classroom and at home. In one study, researchers compared Dutch bilingual children who also spoke either Turkish or German at home. The children who spoke German at home perceived their teachers as appreciating the German language more than did the children who spoke Turkish at home. These more positive perceptions of the teachers' appreciation of German were related to cognitive advantages for the German–Dutch children. (Goriot et al., 2016).

SEPARATING FACT FROM FICTION

Table 2.3 Myths about Bilingual Children: Separating Fact from Fiction

Myth	Fact
Bilingual children often are confused as they learn two distinct languages.	Children do not become confused. They can learn two languages quite well. At times they might use some words interchangeably, but this is normal, and it ceases as children continue to use both languages.
Bilingual children experience difficulties in learning.	There is no truth to this statement. In fact, bilingual children experience some cognitive advantages. For example, some bilingual children experience advantages in being able to inhibit prior knowledge and thus switch between different activities with ease.
It is better to wait until children are older to teach them a second language.	Research generally suggests that children (even very young children) are able to learn a second language quite easily. Nevertheless, it's not as simple as saying "younger is better" for language learning. For example, young children who learn two languages may learn more easily because they are exposed to the second language more regularly than are many children and adolescents who learn a second language later.
Bilingual children are more likely than monolingual children to experience language difficulties or to be diagnosed with a language disorder.	Again, there is no research supporting this myth. Parents of bilingual children may be more apt to assume that their child is experiencing a language problem, but occasional **code-switching** (i.e., using portions of the two languages interchangeably) is a completely normal phenomenon when children are learning two languages.

SOURCES: Bialystok et al., 2012; Byers-Heinlein & Lew-Williams, 2013; Genesee, 2015; Owens, 2020.

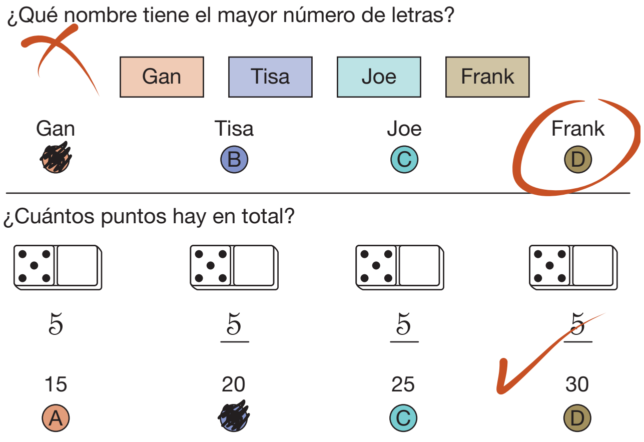
Some educators have misconceptions about bilingualism, particularly among young children. Table 2.3 is provided to address some common misconceptions.

Teaching a Second Language Most children in Western, English-speaking countries are exposed to only one language before they reach school age. That single language may or may not be English. School-age children who are fluent in their native language but not in English are often referred to as **English language learners (ELLs)**. To the extent that elementary and secondary school students have limited knowledge of English, they're apt to have trouble with schoolwork in an English-based classroom (Kieffer, 2008; Padilla, 2006; Slavin & Cheung, 2005; Valdés et al., 2005).

Just as very young children typically learn their native language through informal daily exposure, so, too, can they learn two languages simultaneously if they have frequent, ongoing exposure to both languages. Research indicates that children do not experience confusion when they learn two languages simultaneously (Byers-Heinlein & Lew-Williams, 2013). Figure 2.11 is an example of a second-grade math test given completely in Spanish. This test comes from a school in which children who primarily have been exposed to only English are taught in both Spanish and English throughout the school day, starting in kindergarten; as you can see, by the second grade, the children already are quite proficient in Spanish. However, when children begin to learn a second language at a later age, perhaps in the elementary grades or even later, they often learn it more quickly if their language-learning experiences are fairly structured (Dixon et al., 2012; Strozer, 1994).

Yet teaching a second language for one 45-minute period a day—as is typically done in high schools—hardly promotes mastery. Two more intensive approaches, immersion and bilingual education, can be quite effective, with each being useful in somewhat different situations. To keep our discussion simple, let's assume that students are living in an English-speaking country. If these students are native English speakers, total **immersion** in the second language—hearing and speaking it almost exclusively in the classroom during the school day—appears to be the more effective approach. A variation of this approach is a *dual-immersion* program, in

Figure 2.11 A second-grade math test is given in Spanish to children who have been regularly taught Spanish daily since kindergarten.



¿Qué nombre tiene el mayor número de letras?

Gan Tisa Joe Frank

Gan ● Tisa Ⓑ Joe Ⓒ [✓ Frank Ⓓ]

¿Cuántos puntos hay en total?

5 5 5 5

15 Ⓐ 20 ● 25 Ⓒ 30 Ⓓ

To maximize second-language learning for native English speakers who live in an English-speaking country, completely immerse them in the second language for part or all of the school day.

which some topics are taught exclusively in English and others are taught exclusively in the second language. For native English speakers living in an English-speaking country, immersion in the second language for part or all of the school day helps students acquire proficiency in the language fairly quickly, and any adverse effects on achievement in other academic areas appear to be short lived (Bialystok et al., 2009; Collier, 1992; Genesee, 1985; Padilla, 2006).

In contrast, English language learners living in an English-speaking country typically fare better in **bilingual education**, in which they receive intensive instruction in English while studying other academic subject areas in their native language. Not only is their academic achievement at least as good as or better in bilingual education, but they also have greater self-esteem and better attitudes toward school (Dixon et al., 2012; Garcia & Jensen, 2009; Marsh et al., 2002; Tong et al., 2008; Wright et al., 2000). The optimal bilingual education program proceeds through a gradual phase-in of English in instruction, perhaps in a sequence such as the following:

1. Students join native-English speakers for classes in subject areas that don't depend too heavily on language skills (e.g., art, music, physical education). They study other subject areas in their native language and also begin classes in English as a second language (ESL).
2. After students have acquired some English proficiency, instruction in English begins for one or two additional subject areas (perhaps math and science).
3. When it's clear that students can learn successfully in English in the subject areas identified in Step 2, they join their English-speaking classmates in regular classes in these subjects.
4. Eventually, students are sufficiently proficient in English to join the mainstream in all subject areas, and they may no longer require their ESL classes (Krashen, 1996; Padilla, 2006; Valdés et al., 2005).

Ideally, the transition from instruction in a student's native language to instruction in English occurs very gradually over a period of several years. Simple knowledge of basic conversational English—knowledge collectively known as **basic interpersonal communication skills (BICS)**—isn't enough for academic success in an English-only curriculum. Ultimately, students must have sufficient mastery of English vocabulary and syntax that they can easily understand and learn from English-based textbooks and lectures; in other words, they must have **cognitive academic language proficiency (CALP)**. Such mastery of English takes considerable time to achieve—often 5 to 7 years (Carhill et al., 2008; Cummins, 2000, 2008; Dixon et al., 2012; Padilla, 2006).

Why is immersion better for some students whereas bilingual education is better for others? As we've learned, language is an important foundation for cognitive development: Among other things, it provides symbols for mentally representing the world, enables children to exchange ideas with others, and helps them internalize sophisticated cognitive strategies. Students in an English-speaking country who are immersed in a different language at school still have many opportunities—not only at home but also with their friends and in the local community—to continue using and developing their English. In contrast, nonnative English speakers may have few opportunities outside their homes to use their native language. If they're taught exclusively in English, they may very well lose proficiency in their native language before developing adequate proficiency in English—a phenomenon known as **subtractive bilingualism**—and their cognitive development suffers as a result. Because bilingual education is designed to foster growth in *both* English and a child's native language, it's apt to promote cognitive development as well as English proficiency (Pérez, 1998; Tse, 2001; Winsler et al., 1999).

We must remember that students' native languages are very much a part of their sense of identity—their sense of who they are as people (Nieto, 1995; Tatum, 1997). A high school student named Marisol made the point this way:

> I'm proud of [being Puerto Rican]. I guess I speak Spanish whenever I can. . . . I used to have a lot of problems with one of my teachers 'cause she didn't want us to talk Spanish in class and I thought that was like an insult to us, you know? (Nieto, 1995, p. 127)

Incorporating children's cultural backgrounds as well as their native language into the classroom curriculum can further promote their academic success (Igoa, 1995, 2007; U.S. Department of Education, 1993). The strategies in the Into the Classroom feature "Working with English Language Learners" take language, sense of identity, and culture into account.

Into The Classroom

Working with English Language Learners

- **Teach early reading skills in students' native languages.**

  When working with students whose families recently emigrated from Mexico, a first-grade teacher teaches basic letter–sound relationships and word decoding skills in Spanish (e.g., showing how the printed word *dos*, meaning "two," can be broken up into the sounds "duh," "oh," and "sss").

- **If you don't speak a student's native language yourself, recruit and train parents, community volunteers, or other students to assist in providing instruction in that language.**

  A boy in a kindergarten class has grown up speaking Hmong, a language spoken in some Asian immigrant communities in the United States. His teacher recruits a fourth grader who can read an English picture book to the boy and translate it into Hmong. At one point the teacher points to a lily pad on a page of the book and asks the fourth grader to describe a lily pad in Hmong, as the boy has never encountered lily pads in his own life.

- **Use bilingual software.**

  Conducting a quick Google search using the key terms *bilingual*, *educational*, and *software*, a teacher finds many educational software programs with both English and Spanish options, including some free programs that can easily be downloaded to classroom computers.

- **When using English to communicate, speak more slowly than you might otherwise, and clearly enunciate each word.**

  A third-grade teacher is careful that he always says "going to" rather than "gonna" and "want to" rather than "wanna."

- **Use visual aids to supplement verbal explanations.**

  A high school history teacher uses photographs she has downloaded from the Internet to illustrate her verbal description of ancient Egypt. She also gives students a one-page outline that identifies the main ideas in her lesson.

- **During small-group learning activities, encourage same-language students to communicate with one another in their native language.**

  When a high school science teacher divides students into cooperative groups to study the effects of weight, length, and amount of push on a pendulum's oscillation rate, she puts three native Chinese speakers in a single group. She suggests that they can talk in either English or Chinese as they conduct their experiments.

- **Encourage—but don't force—students to contribute to class discussions in English; be understanding of students who are initially reluctant to participate.**

  A high school social studies teacher often divides his class into small groups to discuss controversial social and political issues. He intentionally places two recent immigrants with peers who are likely to be supportive as these English language learners struggle in their efforts to communicate.

- **Have students work in pairs to make sense of textbook material.**

  As two middle school students read a section of their geography textbook, one reads aloud while the other listens and takes notes. They frequently stop to talk about what they've just read or to switch roles.

- **Have students read, write, and report about their native countries; also, have them create art that depicts aspects of their countries and cultures.**

  A middle school social studies teacher has students conduct research on a country from which they or their ancestors emigrated. The students create posters to display what they've learned and present their posters at a class-sponsored International Day that students from other classes attend.

SOURCES: Strategies are based on research and recommendations by Carhill et al., 2008; Comeau et al., 1999; Duff, 2001; Egbert, 2009; Espinosa, 2007; García, 1995; Herrell & Jordan, 2004; Igoa, 1995, 2007; Janzen, 2008; Krashen, 1996; McClelland, 2001; McClelland et al., 2002; Padilla, 2006; Slavin & Cheung, 2005; Solórzano, 2008; Tong et al., 2008; Valdés et al., 2005; Walshaw & Anthony, 2008.

Chapter 2 What Have You Learned?

As a way of summing up our discussion of development in this chapter, we now return to the learning outcomes identified at the beginning of the chapter.

2.1 **Describe four principles portraying the general nature of child development and the interactive roles of heredity and environment in guiding it.** Children develop skills and abilities in a somewhat predictable sequence, but they don't all develop at the same rate, and their development in any particular domain is apt to show occasional spurts within periods of slower growth. To some degree, children's developing physical, cognitive, personal, and social characteristics depend on maturation—that is, on a genetically driven unfolding of physiological advancements. But equally critical is an environment that nurtures and supports the acquisition of new knowledge and skills. As is evident in Urie Bronfenbrenner's bioecological systems theory, children grow up within the context of several layers of environmental influence, some of which affect them directly (as is true for family and school environments) and others of which have indirect effects on their development (as is true for parents' employment circumstances and general government policies); each of these layers reflects the particular practices and beliefs of one or more cultural groups. At the same time, children also *change* their environment—and thus also change how their environment affects them—in part by eliciting certain kinds of behaviors from others and in part by choosing among the various opportunities and activities that come their way.

2.2 **Explain how the brain and its development influence children's thinking and learning.** The human brain changes in significant ways throughout childhood, adolescence, and early adulthood, partly as a result of environmental experiences and partly as a result of such genetically driven processes as synaptogenesis, synaptic pruning, and myelination. Although different parts of the brain have different specialties, they are closely interconnected and all work together to support complex human activities. The brain has considerable *plasticity*—that is, it can learn a great many new things at virtually any age. As teachers, we should be optimistic that students can acquire a wide variety of knowledge and skills in both the elementary and secondary grades. Yet we must keep in mind that even at the high school level, many students' brains haven't sufficiently matured to support planning, reasoning, impulse control, and other abilities important for independent learning and responsible behavior.

2.3 **Apply Piaget's theory of cognitive development to classroom practice.** Swiss psychologist Jean Piaget proposed that children are intrinsically motivated to make sense of their world and self-construct increasingly complex understandings of it through the two complementary processes of assimilation and accommodation. His four stages of cognitive development give us a rough idea of when various logical thinking capabilities are likely to emerge; however, most contemporary developmental theorists believe that children's developmental progress can probably be better characterized as gradual trends that depend at least partly on children's specific informal experiences and formal instruction.

Piaget's theory has numerous implications for classroom practice. For example, his clinical method offers a way of exploring children's reasoning processes in depth. His proposal that abstract thinking doesn't appear until adolescence encourages us to make heavy use of concrete, hands-on experiences in the elementary and middle school grades. His concept of disequilibrium suggests that by challenging students' illogical reasoning, we can sometimes spur them to revise incomplete understandings and think in more sophisticated ways.

2.4 **Apply Vygotsky's theory of cognitive development to classroom practice.** In contrast to Piaget, who portrayed children as being largely in control of their own cognitive development, Russian psychologist Lev Vygotsky proposed that children's cognitive development is a very social enterprise. In particular, adults and other more advanced individuals communicate the meanings their culture assigns to objects and events, pass along physical and cognitive tools that make everyday tasks and problems easier, and assist children with tasks within each child's zone of proximal development. In Vygotsky's view, social activities are often precursors to and form the basis for complex mental processes: Children initially use new skills in the course of interacting with adults or peers and slowly internalize and adapt these skills for their own, independent use. Vygotsky's theory suggests that, as teachers, we should help students make sense of their experiences (e.g., by tying their observations to particular scientific concepts and principles), assign activities that require them to stretch their existing abilities, scaffold their efforts on challenging new tasks, and have them occasionally work in small groups to tackle multifaceted issues and problems.

2.5 **Describe developmental changes in language during the school years and explain how you might adapt instruction to children with diverse linguistic abilities and needs.** By the time they reach kindergarten, most children have considerable proficiency in their native language. Nevertheless, their language development continues throughout the school years. For example, in addition to acquiring an ever-expanding vocabulary, children become increasingly able to listen effectively, conduct sustained conversations about particular topics, and comprehend the underlying meanings of figurative speech.

Both hereditary and environmental factors contribute to language development. One important environmental variable is, of course, the particular language—or languages—children speak at home and in their communities. Researchers have identified many advantages to knowing two or more languages, including more advanced metalinguistic awareness, more creative thinking, and greater cross-cultural understanding. Different approaches to promoting bilingualism are recommended in different situations. In an English-speaking community, native English speakers can gain fluency in a second language through complete or partial immersion in that language at school, but students who speak a language other than English at home typically achieve at higher levels in bilingual education programs.

Practice for Your Licensure Exam

A Floating Stone

After lunch one day, first-grade teacher Mr. Fox calls his students to the carpet area so that he can show them a "curious thing." Once the children are all seated and attentive, he puts a large fishbowl in front of them and fills it with water. Then, out of his jacket pocket, he pulls a piece of granite a little smaller than a golf ball and holds the stone over the bowl.

"What's going to happen when I drop this stone into the water?" he asks the children. "Do you think it will float like a boat does?"

Several of the children shout, "No, it's gonna sink!" Mr. Fox drops the stone into the water, and, sure enough, it sinks.

"You were right," Mr. Fox says. "Hmm, I have another stone in my pocket." He pulls out a much larger one—in this case, a piece of pumice (cooled lava) that is filled with tiny air pockets. "When I was traveling last summer, I found this at the bottom of an old volcano. Do you think this one will sink like the other one did?"

The children declare that it will definitely sink. Mr. Fox drops it into the fishbowl, where it momentarily submerges and then floats to the surface. "Hmm, what just happened?" he says as he looks inquisitively at his class.

Many of the children gasp with surprise. When a girl named Cora insists, "You didn't do it right!" Mr. Fox retrieves the pumice and drops it in the water again, with the same result. "No, no, that's impossible!" Cora yells. "Stones always sink—*always!*" She rubs and shakes her head, almost as if she's a bit upset. (Case based on similar lesson described by Hennessey & Beeth, 1993.)

1. **Constructed-response question:**

   Cora is noticeably surprised and possibly upset when she sees the pumice float.

   A. Use one or more concepts from Jean Piaget's theory of cognitive development to explain why Cora reacts as strongly as she does to the floating pumice.

   B. Again drawing on Piaget's theory, explain why Mr. Fox intentionally presents a phenomenon that will surprise the children.

2. **Multiple-choice question:**

   Imagine that you perform the same demonstration with high school students rather than first graders. If you were to make use of Vygotsky's theory of cognitive development, which one of the following approaches would you be most likely to take in helping the students understand the floating pumice?

a. Before performing the demonstration, ask students to draw a picture of the fishbowl and two stones.

b. Drop several light objects (e.g., a feather, a piece of paper, a small sponge) into the fishbowl before dropping either stone into it.

c. Teach the concept of density and explain that an object's average density relative to water determines whether it floats or sinks.

d. Praise students who correctly predict that the larger stone will float, even if they initially give an incorrect explanation about why it will float.

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 3

Personal and Social Development

FatCamera/E+/Getty Images

Learning Objectives

3.1 Describe the nature and origins of children's temperaments and personality characteristics, and explain how you might adapt your classroom practices to students' diverse personalities.

3.2 Explain how students' sense of self is apt to influence their behavior and how you can help students develop healthy self-perceptions.

3.3 Apply your knowledge of peer relationships and social cognition as you identify strategies for promoting productive social skills and addressing student aggression.

3.4 Describe typical advancements in moral and prosocial development over the course of childhood and adolescence, and identify strategies for promoting moral and prosocial development at school.

CASE STUDY

Angelina Martin is a new fifth-grade teacher. On the first day of school, she asks each of her students to anonymously write down one sentence that describes the most important piece of information they'd like Ms. Martin to know about them. That evening, Ms. Martin reads through the responses:

I'm mostly happy.	I like computers.	I get into a lot of fights.	I'm Black.
I have a lot of friends.	My family is messed up.	I'm going to be a millionaire.	I'm a good person.
I'm good at math but not at reading.	I am good at sports.	I like using SnapChat.	I am usually in a good mood.
I'm really quiet.	I hate school.	I like to write stories.	I like video games.
Sometimes I'm not nice to my friends.	I get picked on by other kids.	I'm good at playing the guitar.	I'm tall.
My best friend is in another class, and that stinks.	My grandma is from Italy.	I don't like science.	I like to read.

As a new teacher, Ms. Martin had thought that most of her students would tell her about something related to school. But she was very surprised to see how diverse their descriptions were. A few of her students wrote about school, but some of them told her about what they like to do outside of school (e.g., "I like video games"), some described what they are like as individuals (e.g., "I'm really quiet"), some mentioned their friends (e.g., "I have a lot of friends"), and some mentioned physical characteristics (e.g., "I'm tall"). The next day, Ms. Martin mentioned this activity and how surprised she was by the wide range of responses to two more experienced fifth-grade teachers. They snickered, and one of them said, "Welcome to the fifth grade." The other one said, "That's a great reminder about these kiddos. We're not just teaching their brains, we are teaching the whole child. There's lots of stuff going on in their lives."

- Were you surprised by the diversity of responses provided by the students?
- Is it really necessary for educators to be concerned about our students' likes and dislikes, their personalities, and their peer groups?

Success in school requires more than just cognitive and linguistic skills. As teachers, we need to acknowledge that students are also developing an understanding of who they are, what they like, and how to interact with others. In this chapter, we are going to explore these other areas of development. First, we'll focus on students' **personal development**, whereby children and adolescents develop their emerging personality traits and their understanding of who they are as individuals. Then we'll look at **social development**, whereby students come to develop productive social skills and interpersonal relationships, and gradually internalize their society's standards for behavior.

Just as with cognitive development, we'll see that our students' personalities and social interactions develop in somewhat predictable patterns, although development will occur at different rates for different children. Moreover, some personality traits and social skills may develop rapidly, but then there may be a long period of time until subsequent development occurs. Finally, as with cognitive development, both heredity and the environment affect social and personality development.

Personality Development

Learning Objective 3.1 Describe the nature and origins of children's temperaments and personality characteristics, and explain how you might adapt your classroom practices to students' diverse personalities.

All of us have unique qualities that make us different from the people around us. Our distinctive ways of behaving, thinking, and feeling comprise our **personalities**. For example, some students tend to be quiet and well behaved in class, while others are noisy and rambunctious. And whereas some students are conscientious about completing their work, others are easily distracted and must be prodded to stay on task.

Children's personalities are the result of both heredity—especially in the form of inherited temperaments—and environmental factors. As you will see, heredity and environment often interact in their influences.

Temperament

Temperament is a general tendency to respond to and deal with events in particular ways. Children seem to have distinct temperaments almost from birth. Researchers have identified many temperamental styles that emerge early in life and are relatively enduring, including adaptability, self-control, persistence, adventurousness, outgoingness, shyness, fearfulness, irritability, and distractibility. Most researchers agree that these temperamental differences are biologically and genetically based, and to some degree the differences persist into adolescence and adulthood (Else-Quest et al., 2006; Keogh, 2003; Polderman et al., 2015; Rothbart, 2011; Stallings & Neppl, 2021; Thomas & Chess, 1977).

Children's and adolescents' environments, in the form of their daily interactions and activities, will be influenced by their temperaments; consequently, those daily events can affect other aspects of their personal and social development (Fox et al., 2001; Rothbart, 2011; Strelau, 2008). For example, children who are energetic and adventuresome seek out a wider variety of experiences than those who are quiet and restrained. Moreover, children who are naturally vivacious and outgoing typically have more opportunities to learn social skills and establish rewarding interpersonal relationships—including good relationships with their teachers—than do children who are quiet and shy.

Furthermore, many temperamental characteristics affect how students engage in and respond to classroom activities, and thus indirectly affect their academic achievement (Keogh, 2003; Martin et al., 2013; Saudino & Plomin, 2007). For instance, students are more likely to achieve at high levels if they are persistent and able to ignore minor distractions. They can also achieve greater academic success if their behaviors lead to friendly, productive relationships with teachers and peers—people who can bolster their self-confidence and support their efforts to learn. An aspect of temperament that is particularly relevant to academic success is **effortful control**—students' general ability to inhibit immediate impulses in order to think and act productively (Rothbart, 2011; Valiente et al., 2010). For example, a student might want to sneak out their smartphone during a math lesson and text a friend; however, if they are able to control that impulse and focus on the lesson, they will certainly learn more during math class.

Environmental Influences on Personality Development

Genetic differences in temperament are only *predispositions* to behave in certain ways, and environmental conditions and experiences point different children with the same predispositions in somewhat different directions. Two key environmental factors influencing personality development are family dynamics and cultural expectations for behavior.

Family Dynamics The interactions that children and adolescents have with other members of their families have both short- and long-term effects on personality development. This starts during infancy; early relationships between infants and their caregivers help infants to learn how to trust others. When babies receive consistent care and love, a strong, affectionate caregiver–child connection known as **attachment** typically forms (Ainsworth et al., 1978). Infants who become closely attached to parents or other caregivers are likely to develop into sociable, independent, self-confident children who adjust easily to new school and classroom environments, establish productive relationships with teachers and peers, and have an inner conscience that guides their behavior. In contrast, children and adolescents who haven't become closely attached early in life can be immature, dependent, unpopular, and prone to disruptive and aggressive behaviors later (Allen et al., 2007; Kochanska et al., 2004; Lewis-Morrarty et al., 2015; Matte-Gagné et al., 2018; Mikulincer & Shaver, 2005;).

Approaches to Parenting. Think back to your own childhood. How would you characterize the way that your parent(s) interacted with you? You may recall times when your parent(s) gave you a great deal of freedom, and other times when they were very strict and imposed stringent rules. There are a number of different ways that parents and other caregivers interact with children.

For many years, researchers mainly used the following distinctive parenting styles to characterize the relationships between caregivers and children:

- *Authoritative parenting* is a parenting style characterized by affection and respect for children, with reasonable restrictions on behavior. Authoritative parents provide love and support, hold high expectations and standards for performance, explain why behaviors are or are not acceptable, enforce rules consistently, include children in decision making, and provide age-appropriate opportunities for autonomy.
- *Authoritarian parenting* is a parenting style in which parents demand complete and immediate compliance. Authoritarian parents generally don't provide reasons for their requests, and they don't negotiate their decisions with their children.
- *Permissive parenting* gives children a great deal of freedom. Permissive parents tend to let their children come and go as they please, and they impose few consequences for inappropriate actions.

Research suggests that **authoritative parenting** often leads to positive outcomes for children, including the ability to listen respectfully to others, follow reasonable rules for behavior, work well independently, and strive for academic achievement (Barber et al., 2005; Baumrind, 1989; Bradley, 2010; Carlo et al., 2018; Gray & Steinberg, 1999; Walker & Hoover-Dempsey, 2006). Nevertheless, there are some mixed findings with regard to the benefits of authoritative parenting. For example, the relationship between authoritative parenting and academic achievement is stronger in non-Latinx White families than in Asian families (Pinquart & Kauser, 2018).

In recent years, researchers who study parent–child interactions have begun to discuss parenting styles somewhat differently. Specifically, the influence of the contexts in which families live (i.e., neighborhood, culture, etc.) have been acknowledged as being an important determinant of parenting practices. Parenting practices are best understood when they are interpreted with regard to the beliefs that children and parents have about how and why children should (or should not) behave in certain ways. For example, **authoritarian parenting** can serve a protective role in low-income, inner-city neighborhoods where children and adolescents may be more likely to encounter dangerous situations, compared to youth who live in more affluent neighborhoods. In such contexts, parents may better serve their children by being strict and directive about activities (Hale-Benson, 1986; McLoyd, 1998). Moreover, in some families, high demands for obedience are made within the context of close, supportive parent–child relationships. Underlying the message of control is a more important message: "I love you and want you to do well, but it's equally important that you act for the good of the family and community" (Chen & Wang, 2010; Halgunseth et al., 2006; Kim et al., 2018; Rothbaum & Trommsdorff, 2007). For children of color, there is a positive relationship between academic outcomes (e.g., motivation) and parents' efforts to socialize their children with regard to knowledge, beliefs, and values about their race and ethnicity (Wang et al., 2020).

It also is important to consider the extent to which parents exert **psychological control** and **behavioral control** over their children. Psychological control in particular can lead to problematic outcomes in children and adolescents when parents are extremely authoritarian, when they induce feelings of guilt in their children, when they are intrusive and interfere too often, when they are disrespectful of their children, and when they withdraw love in order to control their child's behavior (Barber et al., 2005, 2012; Lansford et al., 2014; Smetana, 2017). Behavioral control, when used in moderation, can yield potential benefits. Parenting practices indicative of appropriate and adaptive levels of behavioral control include demonstrating consistency in rules and expectations, monitoring of children's behavior and whereabouts, and setting high (but reasonable) standards (Smetana, 2017).

Both excessive psychological and behavioral control can lead to maladaptive outcomes for youth. For example, children whose parents use a great deal of psychological control may experience future mental health problems (e.g., depression) and behavioral problems (e.g., misbehavior; aggressive tendencies) (Kakihara & Tilton-Weaver, 2009). These negative outcomes are particularly likely to emerge when parents are highly disrespectful of their children (Barber et al., 2012; Smetana, 2017).

Overall, research suggests that autonomy-supportive parenting may be particularly beneficial in terms of enhancing academic achievement (e.g., Duineveld et al., 2017). Parenting practices that support children's autonomy during the first three years of life in particular may enhance the development of cognitive skills that children use to focus their attention and behavior, skills that ultimately are predictive of higher achievement during both elementary school and high school (e.g., Bindman et al., 2015).

In the classroom, convey reasonably high expectations and standards for behavior, but always within the context of affectionate and respectful relationships with students.

As teachers, we can certainly serve as sources of information about effective disciplinary strategies. But we should keep in mind that parenting styles have, at most, only a *moderate* influence on children's personalities. Many children and adolescents thrive despite their caregivers' diverse parenting styles, provided those caregivers aren't severely neglectful or abusive. Children with certain temperaments—for instance, those who tend to be adaptable, self-disciplined, and outgoing—seem to be especially resilient in the face of difficult family circumstances (Bates & Pettit, 2007; Belsky & Pluess, 2009; Hart et al., 2003; Rothbart, 2011).

Serve as a resource regarding effective parenting strategies, perhaps through newsletters or parent discussion groups.

Child Maltreatment In a few unfortunate instances, parents' behaviors toward their children constitute **child maltreatment**. Child neglect occurs when parents fail to provide nutritious meals, adequate clothing, and other basic necessities. In other cases, parents or other family members *abuse* children physically, sexually, or emotionally. Possible indicators of neglect or abuse are chronic hunger, lack of warm clothing in cold weather, untreated medical needs, frequent or serious physical injuries (e.g., bruises, burns, broken bones), and unusual knowledge about sexual matters.

Chapter 5 describes possible warning signs that a student is contemplating suicide.

Parental neglect and abuse can have significant adverse effects on children's personal and social development. On average, children who have been routinely neglected or abused have low self-esteem, poorly developed social skills, and low school achievement. Many are angry, aggressive, and defiant; others can be depressed, anxious, socially withdrawn, and possibly suicidal (Crosson-Tower, 2010; Kim & Cicchetti, 2006; Maughan & Cicchetti, 2002; Miller et al., 2013; Thompson & Wyatt, 1999).

Report suspected cases of child maltreatment *immediately*.

Teachers are both legally and morally obligated to report any cases of suspected child abuse or neglect to the proper authorities (e.g., the school principal or child protective services). Three helpful resources are the National Child Abuse Hotline at

1-800-4-A-CHILD (1-800-422-4453), the website for Childhelp at www.childhelp.org, and the Child Welfare Information Gateway (www.childwelfare.gov), which includes specific information for each state in the United States.

Cultural Expectations and Socialization As we've seen, various cultural groups influence children's personalities indirectly through the parenting styles they encourage. Culture also has a more direct influence on children's personal and social development through a process known as **socialization**—that is, members of a cultural group work hard to help children adopt the behaviors and beliefs that the group holds dear. Children typically learn their earliest lessons about their culture's expectations for behavior from parents and other family members, who teach them simple manners (e.g., saying "please" and "thank you"), encourage them to do well in school, and so on (Chen & Gregory, 2008; Eccles, 2007). Once children reach school age, teachers also become important socialization agents. For example, in mainstream Western society, teachers typically expect and encourage such behaviors as showing respect for authority figures, following rules and directions, controlling impulses, working independently, and asking for help when it's needed (Manning & Baruth, 2009; Wentzel & Looney, 2007). Cultures around the globe encourage many of these behaviors, but they don't necessarily endorse *all* of them. For instance, many children of Mexican heritage are more accustomed to observing events quietly and unobtrusively—rather than asking adults for explanations and help (Correa-Chávez et al., 2005; Gutiérrez & Rogoff, 2003).

Chapter 4 examines cultural differences such as these in greater depth.

Researchers have observed other cultural differences in socialization practices as well. For example, many European American families encourage children to think for themselves and be assertive in expressing their needs and opinions, but families from many other countries (e.g., Mexico, China, India) are more likely to encourage restraint, obedience, and deference to elders (Goodnow, 1992; Joshi & MacLean, 1994; Morelli & Rothbaum, 2007). Whereas many American children are encouraged to be outgoing and emotionally expressive, children in many Asian cultures are encouraged to be quiet and emotionally reserved (Chen et al., 2009; Huntsinger & Jose, 2006; Morelli & Rothbaum, 2007). However, considerable diversity exists *within* any culture, with different parents, teachers, and other adults encouraging somewhat different behaviors and beliefs.

When behaviors expected of students at school differ from those expected at home, children may initially experience some **culture shock**. At a minimum, these children are apt to be confused and distracted, at least in the first few days or weeks of school. Some children with less adaptable or more irritable temperaments may even become angry or resistant (Rothbart, 2011; Ward et al., 2001).

As teachers, we must certainly encourage behaviors important for students' long-term success, such as obeying rules, following instructions, and working independently. At the same time, students will need our guidance, support, and patience when our expectations differ from those of their family or cultural group.

The "Big Five" Personality Traits

As children grow older, the many interactions among their inherited temperaments and environmental circumstances lead to unique and somewhat stable personality profiles. Research with both children and adults has yielded five general personality traits that are relatively independent of one another and appear to involve somewhat different areas of the brain. You can remember them using the mnemonic *OCEAN:*

- *Openness:* The extent to which one is curious about the world and receptive to new experiences and ideas
- *Conscientiousness:* The extent to which one is careful, organized, self-disciplined, and likely to follow through on plans and commitments

- *Extraversion:* The extent to which one is socially outgoing and seeks excitement
- *Agreeableness:* The extent to which one is pleasant, kind, and cooperative in social situations
- *Neuroticism:* The extent to which one is prone to negative emotions (e.g., anxiety, anger, depression) (Caspi, 1998; DeYoung et al., 2010; Lehmann et al., 2013; Martin et al., 2013; Matthews et al., 2006)

Our students' personality traits lead to some consistency—but not *total* consistency—in how they behave (Hampson, 2008; Mendoza-Denton & Mischel, 2007). Variability is particularly common when circumstances change considerably. For instance, a student might be very outgoing and sociable with his close friends, but shy and withdrawn

Remember that despite some consistency in students' personalities, their behaviors are likely to vary somewhat in different contexts.

Creating a Productive Classroom Environment

Accommodating Students' Diverse Temperaments and Personality Traits

Minimize downtime for students with high energy levels.

As a way of letting Mark, a chronically restless third grader, release pent-up energy throughout the school day, the teacher gives him small chores to do (e.g., erasing the board, sharpening pencils, cleaning art supplies) and shows him how to complete the chores quietly so as not to disturb his classmates.

Provide many opportunities for highly sociable students to interact with classmates.

During a unit on immigration, a seventh-grade teacher assigns a project in which students must describe some of the challenges faced by immigrants. The teacher provides the students with several different ways to complete this project (e.g., by writing a research paper, drawing a map on poster board, creating a miniature three-dimensional model). The students can choose to work on the project alone or with one or two classmates, with the stipulation that students who work with peers must undertake more complex projects than students who work alone.

Be especially warm and attentive with very shy students, and identify contexts in which they feel comfortable interacting with peers and openly expressing their ideas.

A ninth-grade teacher has a new student join one of his classes midway through the school year. The student comes to class alone each day and doesn't join in conversations with peers before or after class. When the teacher sees her eating lunch by herself in the cafeteria one day, he sits beside her, invites some other students to join them, and engages her in conversation about her previous school and community. The following day in class, he assigns a small-group, cooperative learning project that students will work on periodically over the next two weeks. He forms cooperative groups of three or four students each, making sure to place the new girl with two students he knows will be friendly and helpful to her.

When students have trouble adapting to new circumstances, give them advance notice of unusual activities and provide extra structure and reassurance.

A kindergarten teacher has discovered that two children in his class do well when the school day is orderly and predictable but often become anxious or upset when the class departs from its usual routine. To prepare the children for a field trip to the fire station on Friday, the teacher begins to talk about the trip at the beginning of the week, explaining what the class will do and see during the visit. He also recruits the father of one of the anxiety-prone children to serve as a parent assistant that day.

If students seem overwhelmed by noisy or chaotic situations, locate or create a calm and peaceful environment for them.

Several middle school students find the school cafeteria loud and unsettling. Their math teacher offers her classroom as a place where they can occasionally eat instead. On some days, she eats with them; at other times, she sits at her desk and grades papers, but the students know she will gladly stop to talk if they have a question or concern.

Teach self-control strategies to students who act impulsively.

A high school student often shouts out opinions in her history class. One day the student's teacher takes her aside and gently explains that her lack of restraint is interfering with classmates' ability to participate in discussions. To sensitize the student to the extent of the problem, the teacher asks her to keep a daily tally of how many times she talks without first raising her hand. A week later, the two meet again, and the teacher suggests a quiet self-talk strategy that can help the student participate actively without dominating a discussion.

SOURCES: Chang & Davis, 2009; Keogh, 2003.

with people he doesn't know very well. And a student is more likely to be conscientious about completing homework if she is given some guidance about how to organize her assignments in a "to-do" list.

Temperament, Personality, and Goodness of Fit

On average, students who are conscientious about their work and open to new experiences achieve at higher levels (Hattie, 2009; Martin et al., 2013; O'Connor & Paunonen, 2007). Yet there is no single best temperament or personality that maximizes students' adjustment and achievement. Instead, children are more likely to succeed at school when there is a **goodness of fit**—rather than a mismatch—between their natural inclinations and typical behaviors on the one hand, and classroom activities and expectations on the other (A. Thomas & Chess, 1977). For example, when teachers want students to participate actively in whole-class discussions, highly energetic, outgoing children are apt to shine, but quieter students might feel anxious or intimidated. When teachers require a lot of independent seatwork, quieter children often do well, but some energetic children may be viewed as disruptive (Keogh, 2003; Rothbart, 2011).

As teachers, we also need to reflect on our own feelings toward our students. Some of our students' temperaments may lead us to see them as less likeable than others. It is important for us to think about our relationships with and feelings toward individual students, because, as we will see later in this book, these perceptions of our students can impact their motivation and learning (Herman et al., 2020). Moreover, keep in mind that students' distinctive ways of behaving in the classroom—their energy levels, sociability, impulsiveness, and the like—aren't entirely within their control. The Creating a Productive Classroom Environment feature "Accommodating Students' Diverse Temperaments and Personality Traits" offers several suggestions for adapting instruction and classroom management strategies to accommodate students' individual behavioral styles.

Development of a Sense of Self

Learning Objective 3.2 Explain how students' sense of self is apt to influence their behavior and how you can help students develop healthy self-perceptions.

With their increasing capacity for symbolic thinking and (eventually) abstract reasoning, growing children begin to draw conclusions about who they are as people. As an example, try the following exercise.

Experiencing Firsthand

Describing Yourself

List at least 10 words or phrases that describe you as a person.

How did you describe yourself? Are you smart? Friendly? Open-minded? Physically attractive? Moody? Your answers provide a window into a key component of your personality known as **sense of self**—your perceptions, beliefs, judgments, and feelings about who you are as a person. Many psychologists distinguish between two aspects of the sense of self: *self-concept*—assessments of one's own characteristics, strengths, and weaknesses—and *self-esteem*—judgments and feelings about one's own value and worth. These two aspects closely overlap, however, and thus the two terms are often used interchangeably (Bracken, 2009; Byrne, 2002; McInerney et al., 2008).

Young children tend to make distinctions between two general domains: how competent they are at day-to-day tasks (including schoolwork), and how much their family and friends like them. As they grow older, children make finer and finer distinctions—for instance, they realize that they may be more or less competent or "good" in various academic subjects, athletic activities, peer relationships, and physical attractiveness (Arens et al., 2011; Davis-Kean & Sandler, 2001; Harter, 1999; Pinxten et al., 2015). Each of these domains may have a greater or lesser influence on students' overall sense of self. For some students, academic achievement may be the overriding factor, whereas for others, physical attractiveness or popularity with peers may be more important (Crocker & Knight, 2005; Hart, 1988; Harter, 1999).

Children and adolescents tend to behave in ways that mirror their beliefs about themselves (Caldwell et al., 2004; Marsh & O'Mara, 2008; Valentine et al., 2004). For instance, if they see themselves as good students, they're more likely to pay attention, persist at difficult problems, and enroll in challenging courses. If they see themselves as friendly and socially desirable, they're more likely to seek the company of their classmates and perhaps run for student council.

Students' beliefs about themselves, like their beliefs about the world around them, are largely self-constructed; however, their self-assessments may or may not be accurate. When students evaluate themselves fairly accurately, they're in a good position to choose age-appropriate tasks and activities (Baumeister et al., 2003; Harter, 1999). A slightly inflated self-assessment can be beneficial as well, because it encourages students to work toward challenging yet potentially reachable goals (Bjorklund & Green, 1992; Pajares, 2009). Students' sense of self with regard to academics is related to their achievement—a high academic self-concept is associated with greater achievement, although the relationship between academic self-concept and achievement is stronger for higher achieving (compared to lower achieving) students (Keller et al., 2021; Susperreguy et al., 2018). Students develop academic self-concepts over time, as they compare their performance with that of their peers and across different subject areas, particularly as they get older (Fleischmann et al., 2022). However, a sense of self that is *too* inflated can give some students an unwarranted sense of superiority over classmates and lead them to bully or act aggressively toward peers (Baumeister et al., 2003; Menon et al., 2007). Students who significantly *under*estimate their abilities are apt to avoid the many challenges that would enhance their cognitive and social growth (Schunk & Pajares, 2004; Zimmerman & Moylan, 2009).

Factors Influencing Sense of Self

Students often gain initial insights about their general competence in a certain domain from their *own successes and failures* in that domain (Chiu, 2012; Marsh & O'Mara, 2008), and these insights are often acquired at school (Verhoeven et al., 2019). For instance, they may discover that they can easily solve—or, instead, consistently struggle with—simple math problems. Or they may find that they can run faster—or more slowly—than most of their peers. Through such experiences, students acquire a sense of **self-efficacy** about the degree to which they can succeed in certain activities and accomplish certain goals. Over time, students' specific self-efficacies for various tasks and activities contribute to their more general sense of self (Bong & Skaalvik, 2003; McInerney et al., 2008).

Unfortunately, a poor sense of self often leads to less productive behaviors, which leads to fewer successes, which in turn perpetuates the poor sense of self. However, simply telling students that they're good or smart or in some other way "special" is unlikely to break the cycle (Brummelman et al., 2014; Pajares, 2009). Instead, we must make sure that students have many opportunities to improve and eventually succeed at academic, social, and physical tasks—not obviously easy tasks (which presumably anyone could do) but challenging ones that reflect a genuine sense of accomplishment.

Enhance students' sense of self by supporting their efforts to meet new challenges.

When we present such challenges, we must, of course, be sure that students have the prerequisite knowledge and scaffolding they need to be successful (Bouchey & Harter, 2005; Dunning et al., 2004; Leary, 1999).

Yet students' personal successes and failures aren't the only things affecting their sense of self. A second important factor is students' social context—and more specifically, *other people's behaviors*—which influences their self-perceptions in at least two ways. For one thing, how students evaluate themselves depends to some extent on how their own performance compares to that of their peers. For example, students who see themselves achieving at higher levels than classmates are apt to develop a more positive sense of self than those who consistently find themselves falling short (Becker & Neumann, 2018; Butler, 2008; Liem et al., 2013; Trautwein et al., 2008). Thus, peer comparisons can dampen high-ability students' sense of self when they attend classes made up largely of students with similarly high ability (Chiu, 2012; Seaton et al., 2010).

In addition, students' self-perceptions are affected by how others behave *toward* them. Peers often communicate information about children's social and athletic competence, perhaps by seeking out a child's companionship or making fun of a child in front of others (Caldwell et al., 2004; Crosnoe, 2011; Rudolph et al., 2005). Adults, too, influence children's sense of self, in part by the kinds of expectations they hold for children's performance and in part by drawing attention to various things children do well or poorly (Harris & Rosenthal, 1985; O'Mara et al., 2006; Pajares, 2009). As teachers, we should communicate realistically high expectations for achievement and give positive feedback about the specific things students do well. And when we find that we must give students negative feedback—and occasionally, we must—we should do so while also communicating optimism about their future performance and strategies to support their future success. For instance, we might point out that mistakes are a natural part of the learning process, and we should offer concrete suggestions about how to improve.

Minimize competitive situations in which students might compare themselves unfavorably with peers, and present any negative feedback within the context of an optimistic message about future performance.

A third factor that can affect students' sense of self is *membership in a successful group* (Harter, 1999; Thorkildsen et al., 2008; Wigfield et al., 1996). If you think back to your own school years, perhaps you can recall taking pride in something your entire class accomplished or feeling good about a community service project completed through an extracurricular club. School groups aren't the only groups affecting students' sense of self. For instance, some cultures encourage children to take pride in the accomplishments of their families as well as—or perhaps instead of—their own accomplishments (Banks & Banks, 1995; Cole & Tan, 2007). And as we'll see a bit later in the chapter, students' membership in certain ethnic groups can also be a source of pride.

Chapter 11 describes more specific effects of teacher expectations.

Get students actively involved in successful group activities.

Forming an Identity: Developmental Changes in Sense of Self

A child's **identity** is a self-constructed definition of who they are, what things they find important, and what goals they want to accomplish in life. Students' identities are based on their self-perceptions (i.e., self-concept and self-efficacy). But as children become adolescents and adolescents become adults, many of their self-perceptions change. We've already seen one way in which self-perceptions change with age: Children increasingly differentiate among the many aspects of who they are as people—their academic abilities, physical qualities, social relationships, and so on; however, children's and adolescents' beliefs and feelings about themselves change in other ways as well. One theorist, Erik Erikson, proposed that people's identities continue to evolve throughout the life span in a predictable sequence of *psychosocial stages*, described in Table 3.1. It's useful to be aware of Erikson's stages, because they provide information about some of the "big issues" that your students (and adults!) are likely to encounter at different life stages. However, his theory has shortcomings. In particular, his theory was based mostly on anecdotes, not on scientific data. In addition, he based his stages primarily on work with men, and it doesn't consider the important role that culture plays in development

Table 3.1 Erikson's Eight Stages of Psychosocial Development

Stage	Developmental Task	Outcomes
1. Trust vs. Mistrust (Infancy)	To learn whether other people (e.g., caregivers) will satisfy an infant's basic needs (e.g., for food)	Trust (if caregivers are consistent sources of food and comfort) or mistrust (if caregivers are neglectful or abusive)
2. Autonomy vs. Shame/Doubt (Toddler years)	To begin to satisfy one's own needs	Autonomy (if caregivers encourage children to do things on their own, like dressing themselves) or doubt (if caregivers restrict early attempts at self-sufficiency)
3. Initiative vs. Guilt (Preschool years)	To start becoming somewhat independent of caregivers	Initiative (if caregivers and preschool teachers encourage children to try things on their own, and provide appropriate support) or guilt (if adults discourage independence)
4. Industry vs. Inferiority (Elementary school years)	To engage in and persist at different tasks	Industry (if caregivers and teachers recognize and praise children for their accomplishments) or inferiority (if children are punished or berated for their accomplishments)
5. Identity vs. Role Confusion (Adolescence)	To think about and plan for the roles that adolescents might play as adults	Identity (if adolescents are allowed to take the necessary time to seriously consider a variety of possibilities for the future) or role confusion (if adolescents are not able to experiment with different activities and to explore diverse future possibilities)
6. Intimacy vs. Isolation (Young adulthood)	To make long-term social commitments	Intimacy (forming one or more relationships that involve compromise or sacrifice) or isolation (if one is unable to establish deep, meaningful personal relationships)
7. Generativity vs. Stagnation (Middle age)	To contribute to society and guide future generations	Generativity (when individuals make contributions to society and to the development and education of youth) or stagnation (when individuals are self-centered and unwilling to help society move forward)
8. Integrity vs. Despair (Retirement/Old age)	To look back on one's life and feel a sense of accomplishment.	Integrity (if one looks back and feels that they led a happy, productive life) or despair (if one looks back and is dissatisfied with their accomplishments

(e.g.., Chen et al., 2009; Crain, 2005; Josselson, 1988; Powell, 1983). Moreover, the age ranges for each stage are probably more general than what Erikson proposed.

Given the shortcomings in Erikson's model, let's look more closely at how the sense of self develops throughout childhood and adolescence.

Childhood Elementary school children tend to think of themselves in terms of concrete, easily observable characteristics and behaviors, such as their age, sex, and favorite activities (Hart, 1988; Harter, 1983). In racially and culturally diverse communities, where different skin colors, languages, and customs are obvious, children may also classify themselves as belonging to one or another racial or ethnic group (Phinney, 1990; Sheets, 1999). For instance, when she was in second grade, 7-year-old Tina drew the self-portrait shown in Figure 3.1. As a girl with a Native American and Hispanic genetic heritage, she was clearly aware that her hair and skin tone were darker than those of most of her classmates.

Most young children have a generally positive sense of self. Sometimes they believe they're more capable than they really are and that they can easily overcome initial failures (Butler, 2008; Lockhart et al., 2002; Robins & Trzesniewski, 2005). As children have more opportunities to compare themselves with peers during the elementary grades and as they become cognitively more able to *make* such comparisons, their self-assessments become increasingly realistic (Butler, 2008; Chapman et al., 2000; Davis-Kean et al., 2008). They also begin to compare how well they do in one domain (e.g., math) with how well they do in other domains (e.g., language arts). For many children (and adolescents), the development of positive views of one's capabilities in

Figure 3.1 As early as the primary grades, students in racially diverse communities have some awareness of their membership in a particular racial group. Notice how 7-year-old Tina portrays herself as having darker hair and skin than the classmates behind her.

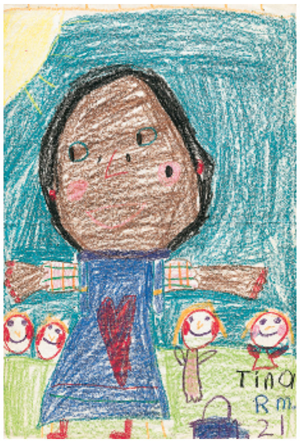
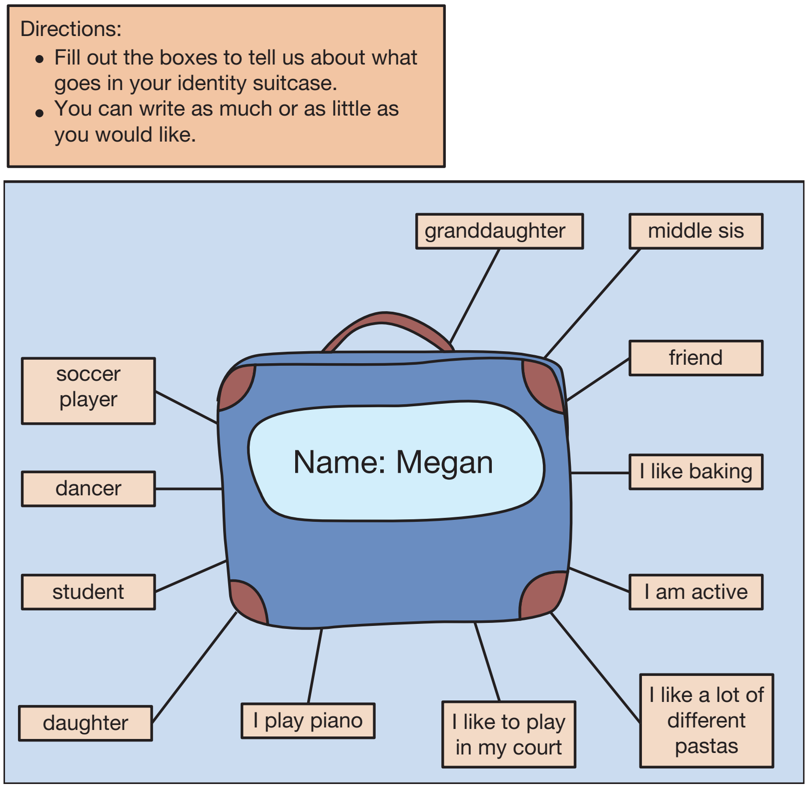


Figure 3.2 Classroom activities can help students to explore multiple aspects of their identities. In this activity, students were asked to come up with descriptors of various aspects of their identity. A suitcase is used so that students can “unpack” their identities. Notice the various identities that Megan, a fourth grader, already has.



Directions:

- Fill out the boxes to tell us about what goes in your identity suitcase.
- You can write as much or as little as you would like.

Developed by Adriana Martinez Calvit, Kimiko Ching, and Shantanu Tilak

one domain may be counterbalanced by the development of less positive views of one’s capabilities in another domains, particularly as children progress through elementary school (Sewasew & Schroeders, 2019; Weidinger et al., 2019). They also begin to pull together their many self-observations into generalizations about the kinds of people they are—perhaps friendly, good at sports, smart, or dumb—and such generalizations lead to the development of increasingly stable self-concepts (Cole et al., 2001; Harter, 1999). Figure 3.2 is an example of an activity that can encourage elementary school students to think about the diverse aspects of their identities.

Remember that a student’s sense of self becomes increasingly stable with age. Especially in the upper elementary and secondary grades, then, enhancing a student’s low self-esteem may take time and persistence.

Early Adolescence As students reach adolescence and gain greater capability for abstract thought, they increasingly think of themselves in terms of general, fairly stable traits. Consider 12-year-old Olivia’s self-description in sixth grade:

> I’m cool. I’m awesome. I’m way cool. I’m 12. I’m boy crazy. I go to Brentwood Middle School. I’m popular with my fans. I play viola. My best friend is Lindsay. I have a gerbil named Taj. I’m adopted. I’m beautiful.

Although Olivia listed a few concrete features, she had clearly developed a fairly abstract self-perception. Her focus on coolness, popularity, and beauty, rather than on intelligence or academic achievement (or, we might add, modesty), is fairly typical: Social acceptance and physical appearance are far more important to many young adolescents than academic competence (Hart, 1988; Harter, 1999).

Students’ self-perceptions often decline as they make the transition from elementary school to middle school, with the drop being more pronounced for girls (Cole et al., 2001; Harter, 1999; Robins & Trzesniewski, 2005). Self-perceptions of ability in specific academic domains are particularly likely to drop when students perceive their own performance in a particular subject area (e.g., language arts) as getting worse over time, or when they perceive themselves as having less ability than their peers in the same grade or class (Dicke et al., 2018; Wolff et al., 2018, 2020). Although self-esteem does not change dramatically across this transition (Scherrer & Preckel, 2019), it's important to recognize that the physiological changes accompanying puberty can impact our students' self-perceptions: Many boys and girls think of themselves as being somewhat less attractive once they reach adolescence (S. Moore & Rosenthal, 2006; Stice, 2003). Changes in the school environment—including disrupted friendships, more superficial teacher–student relationships, and more rigorous academic standards—probably also have a negative impact.

Early adolescents often are very self-conscious; they may spend a great deal of time worrying about how others perceive them (Harter, 1999). Sometimes they may feel as if everyone else is watching and judging them—a phenomenon known as the **imaginary audience** (Elkind, 1981; Ryan & Kuczkowski, 1994; Somerville, 2013). Because they believe themselves to be the center of attention, young teenagers (especially girls) are often preoccupied with their physical appearance and can be quite self-critical. To some degree, this heightened concern about what other people might think of them appears to be linked to maturational changes in certain areas of the brain, including areas that underlie self-focused emotions such as shame and embarrassment (Somerville et al., 2013), and to increased usage of social media (Peters et al., 2021).

A second noteworthy phenomenon in early adolescence is the emergence of the **personal fable**: Young teens often believe they are completely unlike anyone else (Alberts et al., 2007; Elkind, 1981). For instance, they may think that no one else—and certainly not a parent and teacher—has ever experienced the intensity of emotions they feel about thwarted goals or unhappy relationships. Furthermore, some have a sense of invulnerability and immortality, believing themselves immune to the normal dangers of life. Thus, they may take foolish risks, such as experimenting with drugs or alcohol, having unprotected sexual intercourse, texting while driving, and driving at high speeds (DeRidder, 1993; Dodge et al., 2009; Galván, 2012; Nell, 2002). It's important to note, however, that adolescents are apt to take risks even when they *don't* believe themselves to be invulnerable, for reasons you can discover in the Applying Brain Research feature "Understanding and Addressing Adolescent Risk Taking."

Late Adolescence The majority of older adolescents recover sufficiently from the double whammy of puberty and a changing school social environment to enjoy positive self-concepts and overall mental health (Harter, 1999; Powers et al., 1989). The imaginary audience and personal fable phenomena slowly decline, although remnants remain throughout high school.

Older teenagers increasingly reflect on their own characteristics and abilities and begin to struggle with seeming inconsistencies in their self-perceptions, as one ninth grader explained:

> I really don't understand how I can switch so fast from being cheerful with my friends, then coming home and feeling anxious, and then getting frustrated and sarcastic with my parents. Which one is the *real* me? (Harter, 1999, p. 67)

Eventually, perhaps around eleventh grade, most students integrate their various self-perceptions into a complex and multifaceted sense of self that reconciles apparent contradictions—for instance, recognizing that their inconsistent behaviors on different occasions mean that they're "flexible" (Harter, 1999).

In their ongoing search for a long-term identity, adolescents may initially take on temporary identities, aligning themselves with a particular peer group, insisting on a certain mode of dress, or continually changing self-descriptions and photos on Snapchat, Instagram, and other social media (Alemán & Vartman, 2009; Greenhow et al. 2009; Seaton et al., 2006). Adolescents may also have somewhat different identities in different contexts, depending on the traditional roles they have played in each context (Eccles,

Applying Brain Research

Understanding and Addressing Adolescent Risk Taking

The brain continues to mature in important ways throughout adolescence and early adulthood. With puberty come significant changes in brain regions that play a role in pleasure-seeking, potentially heightening the desire for enjoyable activities and immediate rewards. Only later, perhaps in the late teens or early 20s, do regions of the prefrontal cortex that support rational decision making and self-restraint fully mature (Qu et al., 2015; Reyna et al., 2012; Somerville et al., 2010; Steinberg, 2009). Furthermore, young people show significant individual differences in brain activity levels in these important regions—differences that are correlated with their predisposition to seek out exciting but potentially dangerous activities on the one hand, or to be cautious and prudent on the other (Gianotti et al., 2009; Hollenstein & Lougheed, 2013; Joseph et al., 2009).

For such reasons, many adolescents have trouble planning ahead and controlling their impulses (Shulman et al., 2016; Spear, 2007; Steinberg et al., 2009). Moreover, they tend to make choices based on emotions ("This will be fun") rather than on logic ("There's a high probability of a bad outcome") (Casey & Caudle, 2013; Luna et al., 2013; Reyna et al., 2012). In addition, viewing images of risky behaviors on social media may increase the likelihood of an adolescent engaging in a subsequent risky behavior (Sherman et al., 2018). Thus, adolescent risk taking is most common in social contexts, where having fun is typically a high priority and it's easy to get swept away by what peers are doing or suggesting.

With such research findings in mind, we offer two recommendations.

- Channel adolescents' risk-taking tendencies into safe activities. Many adolescents enjoy trying things that are new, different, and perhaps a bit risky; such activities are reasonable if appropriate safeguards are in place. Team sports provide one outlet for both risk taking and social companionship. Preplanned, organized activities during traditionally high-risk periods are also beneficial; for example, many high schools offer all-night after-prom parties to keep students sober and safe when they might otherwise be drinking and driving.
- Provide avenues through which students can safely and productively gain status with their peers. Sometimes adolescents engage in risky behaviors—such as drinking, drug use, and sexual intercourse—in an attempt to project an adult-like image or to be "cool" (Allen & Antonishak, 2008; Blanton & Burkley, 2008; Crosnoe, 2011). There are much healthier ways to show one's social status, some of which we can support at school. Gaining competence and prominence in various arts activities, student government, and community service are just a few of the many possibilities.

2009; Greeno, 2006; Vadeboncoeur et al., 2011). For example, a student might be a "loser" at school but a "star" in an out-of-school activity or a "leader" in a neighborhood gang.

Erikson proposed that most people achieve an overall sense of identity by the end of adolescence (see Figure 3.1). In contrast, many contemporary developmental theorists believe that identity formation continues to be a work-in-progress well into adulthood, especially as people move into new and different life circumstances (Arnett, 2016; Bandura, 2008; Becht et al., 2017; Sinai et al., 2012; Vadeboncoeur et al., 2011). Recent research on identity development in twins suggests that both the context in which a child grows up and genetic factors contribute to identity development (Markovitch et al., 2017). Marcia (1980, 1991) has described four distinct patterns of behavior that may characterize the status of a young person's search for identity:

- *Identity diffusion.* The individual has made no commitment to a particular career path or ideological belief system. Some haphazard experimentation with particular roles or beliefs may have taken place, but the individual hasn't yet embarked on a serious exploration of issues related to self-definition.
- *Foreclosure.* The individual has made a firm commitment to an occupation, a particular set of beliefs, or both. The choices have been based largely on what others (especially parents) have prescribed, without an earnest exploration of other possibilities.
- *Moratorium.* The individual has no strong commitment to a particular career or set of beliefs but is actively exploring and considering a variety of professions and ideologies.
- *Identity achievement.* After going through a period of moratorium, the individual has emerged with a clear choice of occupation, a commitment to particular political or religious beliefs, or both.

For most, the ideal situation seems to be to proceed through a period of moratorium and exploration—a period that may continue well into adulthood—and to eventually settle on a clear identity that can flexibly evolve as life circumstances change (Kaplan & Flum, 2012; Luyckx et al., 2008; Sinai et al., 2012).

Table 3.2 presents developmental changes in children's and adolescents' sense of self and offers suggestions for how, as teachers, we can enhance their self-perceptions at different grade levels.

DEVELOPMENTAL TRENDS

Table 3.2 Sense of Self at Different Grade Levels

Grade Level	Age-Typical Characteristics	Example	Suggested Strategies
K–2	• Self-descriptions focus on observable, concrete characteristics, along with emerging recognition of individualized traits and characteristics. • Some tendency to overestimate abilities and chances of future success, especially in domains in which one has little or no prior experience	When 6-year-old Jeff is asked to describe himself, he says, "I like animals. I like making things. I do good in school. I'm happy. Blue eyes, yellow hair, light skin." He mentions nothing about his shyness, sense of humor, and ability to work and play independently—characteristics that would require considerable self-reflection and abstract thought to identify.	🍏 Encourage students to stretch their abilities by tackling the challenging tasks they think they can accomplish. 🍏 Provide sufficient scaffolding to make success possible in various domains. 🍏 Praise students for the things they do well; be specific about the behaviors you're praising.
3–5	• Increasing awareness of and differentiation among particular strengths and weaknesses • Association of such emotions as pride and shame with various self-perceptions	When Kellen begins fifth grade, his classwork rapidly deteriorates, despite individualized instruction in reading and spelling. At home one day, his mother finds him curled in a ball under his desk, crying and saying, "I can't do this anymore!" Alarmed, Mom takes him to a series of specialists, who diagnose severe dyslexia. Kellen's parents eventually find a school that provides considerable structure and scaffolding for students with learning disabilities. There, Kellen shows dramatic improvement in virtually every area of the curriculum, and his self-esteem skyrockets.	🍏 Focus students' attention on their improvement over time. 🍏 Encourage pride in individual and group achievements, but be aware that students from some ethnic groups may prefer that recognition be given only for group achievements. 🍏 Provide opportunities for students to look at one another's work only when *everyone* has something to be proud of.
6–8	• Increasingly abstract self-conceptions • For many, a decline in self-esteem after the transition to middle school (especially for girls) • Heightened concern about others' perceptions and judgments of oneself (imaginary audience) • Excessive belief in one's own uniqueness, sometimes accompanied by risk taking and a sense of invulnerability to normal dangers (personal fable)	Meghan describes a recent event in her eighth-grade algebra class: "I had to cough but I knew if I did everyone would stare at me and think I was stupid, hacking away. So I held my breath until I turned red and tears ran down my face and finally I coughed anyway and everyone *really* noticed then. It was horrible."	🍏 After students make the transition to middle school, be especially supportive and optimistic about their abilities and their potential for success. 🍏 Minimize opportunities for students to compare their own performance unfavorably with that of others. 🍏 Be patient when students show exceptional self-consciousness; give them strategies for presenting themselves well to others.
9–12	• Search for the "real me" and an adult identity; experimentation with a variety of possible identities • Increasing integration of diverse self-perceptions into an overall, multifaceted sense of self • Gradual increase in self-esteem • Continuing risk-taking behavior (especially for boys)	Sixteen-year-old Kayla often revises her social media profile and regularly changes the photo that appears there. Sometimes she displays a happy Kayla, at other times a sad one; an early photo shows her in her basketball uniform, but a later one shows her in a skimpy party dress.	🍏 Give students opportunities to examine and try out a variety of adult-like roles. 🍏 Encourage students to explore and take pride in their cultural and ethnic heritages. 🍏 When discussing the potential consequences of risky behaviors, present the facts but don't make students so anxious or upset that they can't effectively learn and remember the information (i.e., avoid scare tactics).

SOURCES: Arens & Jansen, 2016; Bracken, 2009; Butler, 2008; Cimpian et al., 2017; Davis-Kean et al., 2008; Dweck, 2000; Elkind, 1981; Figner & Weber, 2011; Greenhow et al., 2009; Harter, 1999; Liem et al., 2013; Lockhart et al., 2002; Marcia, 1980, 1991; McDevitt & Ormrod, 2007 (Kellen example); Nell, 2002; Nuemi, 2008; O'Mara et al., 2006; Orenstein, 1994, p. 47 (Meghan example); Pajares, 2009; Robins & Trzesniewski, 2005; Seaton et al., 2006; Sinai et al., 2012; Somerville et al., 2013; Spear, 2007; Tatum, 1997; Whitesell et al., 2006.

Diversity in Sense of Self

As you undoubtedly know from your own experiences, students differ considerably in their self-esteem and overall sense of self. Sometimes such differences are indirectly the result of biology. For instance, students who are physically attractive tend to have more positive self-concepts than do students with less appealing physical features (Harter et al., 1998). And on average, students with cognitive, social, or physical disabilities have lower self-esteem than their classmates (Marsh & Craven, 1997; Martinez & Huberty, 2010; Novita, 2016).

Gender Differences For most young people, their gender is a core ingredient in their sense of self and can become increasingly prominent during puberty. Thus, many children and adolescents prefer to engage in behaviors and activities that are stereotypically "appropriate" for their gender. For example, to the extent that boys believe that getting good grades at school is something that "girls do," they may have little interest in classroom activities and assignments (Elmore & Oyserman, 2012).

Some researchers have found gender differences in overall self-esteem, with boys rating themselves more highly than others, especially in adolescence. Many students' self-perceptions tend to be consistent with stereotypes about what males and females are supposedly "good at." For instance, even when actual ability levels are the same, boys tend to rate themselves more highly in math and sports, and girls tend to rate themselves more highly in language and literacy (Bracken, 2009; Cole et al., 2001; Herbert & Stipek, 2005; Joët et al., 2011).

We will discuss the development of gender identity in greater detail in Chapter 4, including an in-depth examination of nonbinary conceptions of gender identity.

Cultural and Ethnic Differences Children's and adolescents' self-perceptions also are affected by culture and ethnicity (Hatano & Sugimura, 2017). For example, adolescents in the United States are more likely to describe themselves in terms of social variables (e.g., "I am kind") than are Chinese adolescents (Setoh et al., 2015, p. 950). Moreover, in many Native American communities and many Middle Eastern and Far Eastern countries, children and adolescents see their group membership and connections with other individuals as central parts of who they are as human beings (Kağitçibaşi, 2007; Ross & Wang, 2010; Whitesell et al., 2006). In addition, many young people have a strong **ethnic identity**: They're both aware and proud of their ethnic group and willingly adopt some of the group's behaviors (Kiang et al., 2013; Phinney & Ong, 2007). Ethnic identity develops and changes over time. Particularly during adolescence, ethnically diverse youth are likely to explore on a personal level what it means to belong to a particular ethnic or cultural group, while also thinking about how their ethnic identity is viewed by others (e.g., friends, classmates, and even strangers) (Hughes et al., 2017). Occasionally, students' ethnic identities can lead them to reject mainstream Western values. In some ethnic minority groups, peers may accuse high-achieving students of "acting White," a label that essentially means "You're not one of us" (Bergin & Cooks, 2008; Ogbu, 2008a). For the most part, however, students with a strong and positive ethnic identity do *well* in school both academically and socially, and are more likely to explore, achieve, and ultimately accept a sense of their own identity (Altschul et al., 2006; Hamm et al., 2012; Smokowski et al., 2009; Yip, 2014). Furthermore, pride in one's ethnic heritage and high academic achievement can serve as emotional buffers against other people's prejudicial insults and discrimination (Allen & Aber, 2006; Cook & Ludwig, 2008; DuBois et al., 2002).

Encourage students to take pride in their cultural heritage.

Not all students from diverse backgrounds affiliate strongly with their cultural and ethnic groups. Some students—especially those with multiple racial or cultural heritages—fluctuate in the strength of their ethnic identity depending on the context and situation (Hitlin et al., 2006; Hong et al., 2007; Yip & Fuligni, 2002). Moreover, students who have been adopted may face additional challenges in identify formation, particularly when they are of a different race than their caregivers (Grotevant et al., 2017). In addition, older adolescents may experiment with varying forms of an ethnic identity. Some teens, for instance, may initially adopt a fairly intense, inflexible, and perhaps hostile ethnic identify before eventually retreating to a more relaxed, open-minded, and productive one (Nasir et al., 2009; Seaton et al., 2006).

Development of Peer Relationships and Interpersonal Understandings

Learning Objective 3.3 **Apply your knowledge of peer relationships and social cognition as you identify strategies for promoting productive social skills and addressing student aggression.**

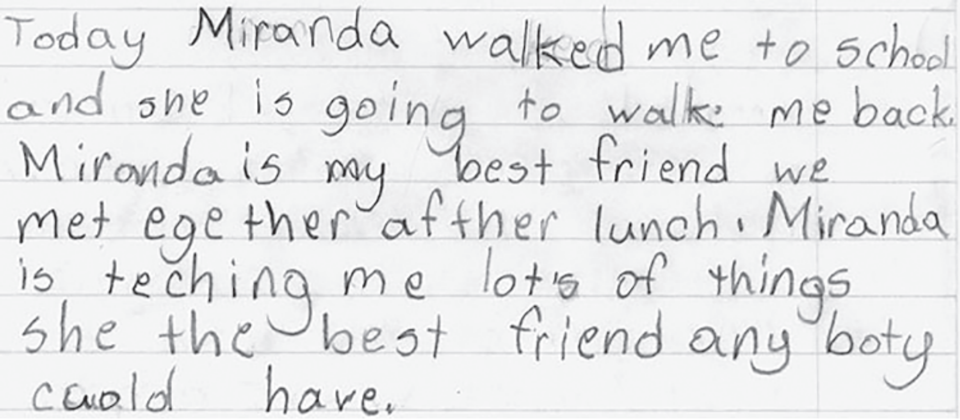
For many students, interacting with and gaining the acceptance of peers are more important than classroom learning and achievement (Crosnoe, 2011; Dowson & McInerney, 2001; LaFontana & Cillessen, 2010). Yet social success and academic success aren't an either/or situation. In fact, students who enjoy good relationships with their peers at school are *more* likely to achieve at high levels (Gest et al., 2005; Patrick et al., 2002; Pellegrini & Bohn, 2005; Wentzel et al., 2021).

Peers' Influences on Development

Children's and adolescents' relationships with their peers (including their friends, classmates, teammates, neighbors, etc.) influence personal and social development in several ways.

- *They provide opportunities to learn and practice a variety of social skills.* By interacting with peers, children and adolescents are able to develop social skills. As youth interact, they learn how to cooperate, negotiate, control their emotions, and resolve conflicts (Allen & Antonishak, 2008; Granic et al., 2014; Larson & Brown, 2007).
- *They can provide each other with support that may not be readily available from adults.* Adults don't always have the expertise that is necessary to help children and adolescents (Barron, 2006; Hickey, 2011; Ladd et al., 2012). One of the authors recalls trying to help his daughter learn how to multiply double-digit numbers (e.g., 15 × 41). The "help-session" became rather unpleasant because the method that his daughter was taught to solve these problems was very different from the strategies that he knew. When parents or adults can't help, children and adolescents can help each other with many tasks. For example, they can help each other complete schoolwork, practice athletic skills (e.g., shooting baskets), or learn how to do new things (e.g., how to create a website).
- *They can provide emotional support and companionship.* As illustrated in Figure 3.3, peers become a group with whom to eat lunch in the cafeteria, a safe haven from playground bullies, and shoulders to cry on in times of trouble or confusion (Jordan, 2006; Laursen et al., 2007; Wentzel, 2009). Many adolescents (especially girls) reveal their innermost thoughts and feelings to their friends (Levitt et al., 1993; Patrick et al., 2002; Rose et al., 2012). Friends often understand a teenager's perspectives—for instance, a preoccupation with physical appearance and concerns about dating—when adults just don't seem to understand.
- *They can promote prosocial behavior.* Peers influence each other's actions, and encourage each other to act (and not act) in certain ways (Jones et al., 2012; Ryan, 2000;

Figure 3.3 In this writing sample, a first grader describes how much she values her friendship with Miranda.



Today Miranda walked me to school
and she is going to walk me back.
Miranda is my best friend we
met egether afther lunch. Miranda
is teching me lot's of things
she the best friend any boty
cauold have.

Wentzel & Watkins, 2011). Children and adolescents often choose to read the same books that their friends read, to watch the same movies and television shows that their friends watch, and to use the same social media platforms as their friends. They serve as role models and provide standards for acceptable behavior, showing what's possible, what's cool, and what's dangerous. They also help each other to set limits on behavior by defining what is and is not acceptable. The phenomenon by which behaviors spread from one child or adolescent to another is described as **peer contagion** (Brown et al., 2008; Dishion & Tipsord, 2011; Dupéré et al., 2021; Sandstrom, 2011).

Although peers influence each other, much of the pressure for children and adolescents to conform to other people's expectations is self-imposed. Most children and adolescents engage in **self-socialization**, putting pressure on *themselves* to adopt the behaviors they think others will find acceptable (Brown, 1990; Bukowski et al., 2008; Crosnoe, 2011; Juvonen, 2006). Such self-pressure tends to be strongest in early adolescence.

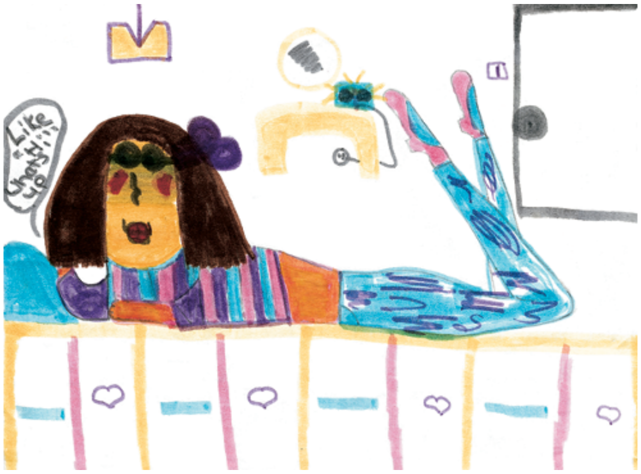
A common misconception is that peer influences are invariably bad, but that's not necessarily the case. Many peers encourage each other to work hard in school, treat people kindly, and engage in community service. Others, however, encourage cutting class, bullying, consuming alcohol or drugs, dropping out of school, or other counterproductive behaviors (Altermatt, 2012; Dupéré et al., 2021; Mayeux et al., 2011; Prinstein & Dodge, 2008; Spinrad & Eisenberg, 2009; Wentzel & Watkins, 2011).

Although peers' behaviors and values certainly have an impact, their effects have probably been overrated. Most children and adolescents acquire a strong set of values and behavioral standards from their families, and they don't necessarily abandon these in the company of peers (B. Brown, 1990; Collins et al., 2000; Galambos et al., 2003). Furthermore, they tend to choose friends who are similar to themselves in academic achievement, leisure-time activities, and long-term goals (Kindermann, 2007; Prinstein & Dodge, 2008; Ryan, 2001). In some cases, they may lead "double lives" that enable them to attain academic success while maintaining peer acceptance (Grimes, 2002; Hemmings, 2004; Juvonen, 2006; Mac Iver et al., 1995). For example, although they attend class and faithfully do homework, they may pretend to be disinterested in their schoolwork, disrupt class with jokes or goofy behaviors, and express surprise at receiving high grades. In addition, they may act tough when they're in public, saving their softer sides for more private situations, as one sixth grader's reflection reveals:

> You'd still have to have your bad attitude. You have to act—it's just like a movie. You have to act. And then at home you're a regular kind of guy, you don't act mean or nothing. But when you're around your friends you have to be sharp and stuff like that, like push everybody around. (Juvonen & Cadigan, 2002, p. 282)

It's important to keep in mind that self-socialization involves adopting behaviors that a child or adolescent *believes* to be critical for gaining favor with their peers. For example, many students think that their peers will look down on them for working hard at school, achieving at high levels, and in other ways being "smart," when in fact their peers may secretly admire such behaviors (Hamm et al., 2012). And in any case, as the brain continues to mature in late adolescence, especially in the relatively "rational" prefrontal cortex, the concern about pleasing peers seems to dissipate a bit (Albert et al., 2013).

As teachers, we can help students maintain positive peer relationships in a variety of ways. For instance, we can help them acquire skills for presenting themselves—perhaps by teaching public-speaking techniques, nurturing artistic talents, or tactfully suggesting personal hygiene strategies. We can assign small-group projects in which every student has a unique talent to contribute. And when classmates ridicule academic achievement, we can allow students to demonstrate their accomplishments privately (e.g., through written assignments or one-on-one conversations) instead of in front of classmates.



Young adolescents often work hard to look cool in the eyes of their peers, as this drawing by 11-year-old Marci illustrates.

Common Social Groups in Childhood and Adolescence

Experiencing Firsthand

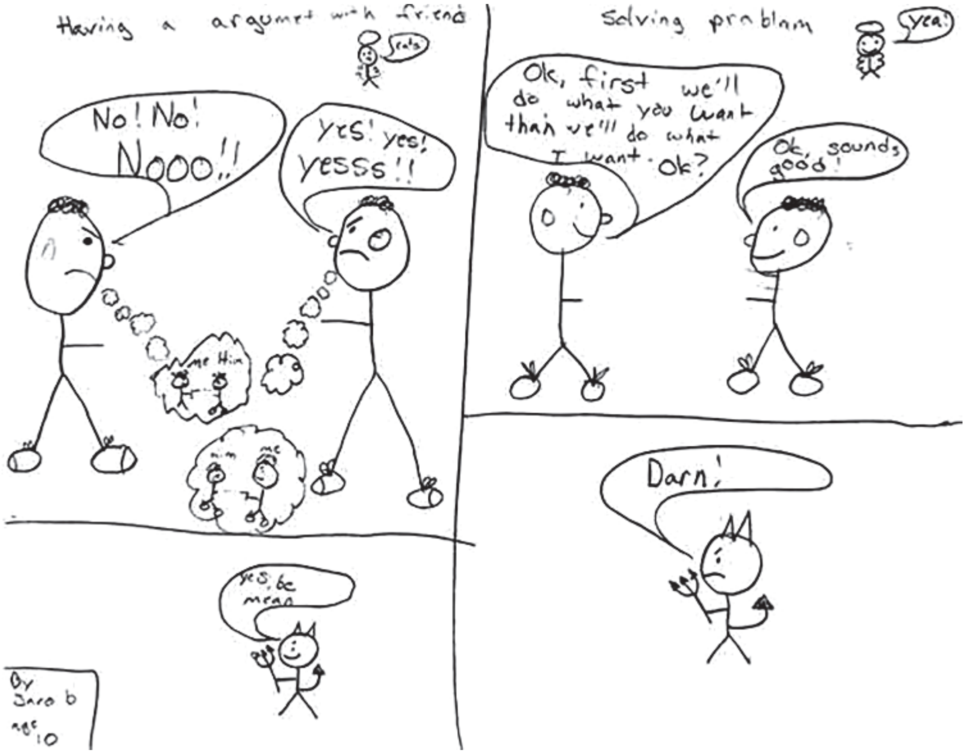
Think back to when you were in a child or an early adolescent. Was there a particular group of peers with whom you tended to associated? How would you describe those peers (i.e., did you all have something in common)? If you wanted to associate with a new or different group of peers, would it have been easy to be accepted in one of those other peer groups?

If you take a moment to think back to your childhood, you probably remember that you had relationships with peers through different social groups. These various groups play differing roles in supporting students' social development and long-term well-being.

Friendships Students spend a great deal of time, both at school and outside of school, with their friends. Close friends share interests, enjoy similar activities, and often share attitudes and perspectives (Gottman, 1986). In order to maintain friendships, students will work to look at situations from one another's point of view and to resolve disputes that threaten to separate them. As a result, they develop increased perspective-taking and conflict resolution skills. The cartoon in Figure 3.4 was created by a 10-year-old child. Note that he already has developed an understanding of how to resolve a conflict that occurred with one of his friends. Many friendships are enduring and stable over long periods of time, but some are brief and may even end abruptly (Brown & Larson, 2009; Meter & Card, 2016). Close, supportive friendships also foster self-esteem and a general sense of well-being (Berndt, 1992; Bukowski et al., 2009; Newcomb & Bagwell, 1995). Both reciprocal friendships and general peer acceptance are important for children's social well-being (Parker & Asher, 1983).

Cliques, Crowds, and Subcultures With age and experience, many students form larger social groups that frequently get together or share common values. In early adolescence, **cliques**—moderately stable friendship groups of perhaps 3 to 10

Figure 3.4 In this cartoon, 10-year-old Jacob describes how to resolve a conflict with a friend.



individuals—provide the setting for most voluntary social interactions. Clique boundaries tend to be fairly rigid and exclusive—some people are "in," whereas others are "out"—and memberships in various cliques often affect students' social status (Brown, 2011; Crockett et al., 1984; Goodwin, 2006; Kindermann et al., 1996). Some students, particularly during adolescence, serve as a broker—a student who maintains membership in more than one clique. There are social advantages to being a broker because these students often maintain positive friendships and relationships with several different groups of peers; however, students who are greatly liked by some peers and disliked by others may experience psychological distress when they serve as brokers (Borowski et al., 2017). Here is 14-year-old Courtney's description of an especially exclusive "popular" clique in her eighth-grade class:

> There are table groups at lunch. My group gave them all names. The popular ones, we call them the Sardines. They are in their little box, they don't let anyone into their box, they're so close together. You'll never see one of them by themselves. Like one of them's a TV and the other ones are like little remotes following her.

Crowds are considerably larger than cliques and don't have the tight-knit cohesiveness and carefully drawn boundaries of cliques. Their members tend to share certain characteristics, reputations, and behaviors (e.g., "brains" study a lot, "jocks" are active in sports), attitudes about academic achievement, and (occasionally) ethnic background (Brown, 2011; Steinberg, 1996). Students may not always be able to choose which crowd they are associated with. For example, membership in a so-called popular crowd is apt to be based as much on a student's reputation as on their actual efforts to affiliate with certain peers (Brown et al., 2008; Juvonen & Galván, 2008). The rigidity of crowd membership tends to peak around middle school, with students finding more freedom to "realign" themselves in high school (Kinney, 2007). The specific types of crowds within a given community will vary. Table 3.3 presents a summary of six different types of crowds that exist in many (but certainly not all) schools.

Table 3.3 Common Peer Crowds in Adolescence

Crowd	Description
Popular	• Value social status • Concerned about physical appearance
Alternative	• Enjoy being different and standing out from the crowd • Prefer alternative musical choices
Hip Hop	• Prefer hip hop and rap music • Sometimes feel they have to work extra hard to succeed
Country	• Value their families and local communities • Enjoy country music and outdoor activities
Jocks	• Very athletic • Sometimes viewed as not being concerned with academics
Brains/Nerds	• Focused on academics • Study a lot • Sometimes seen as antisocial/unpopular

Adapted in part from Jordan et al. (2019).

Occasionally a crowd takes the form of a **subculture**—a group that resists a powerful dominant culture by adopting a significantly different lifestyle (Epstein, 1998). Some subcultures are relatively benign; for example, some young teens may consistently wear baggy pants, address peers as "dude," and spend a good deal of their time mastering new tricks on their skateboards. Other subcultures are worrisome, such as those that endorse racist and anti-Semitic behaviors. Adolescents are more likely to affiliate with troublesome subcultures when they feel alienated from the dominant culture—perhaps that of their school or that of society more generally—and want to distinguish themselves from it (Crosnoe, 2011; Harris, 1998). Moreover, excessive use of the internet and social media may increase the likelihood of adolescents, in particular, affiliating with dangerous subcultures (Filakovska-Bobakova et al., 2018).

In the upper high school grades, a greater capacity for abstract thought allows many adolescents to think of other people more as unique individuals and less as members of stereotypical categories. They may also discover characteristics they have in common with peers from different backgrounds. Perhaps as a result of such changes, ties to specific social groups tend to dissipate, hostilities between groups soften, and students become more open-minded in their friendship choices (Brown et al., 1986; Gavin & Fuhrman, 1989).

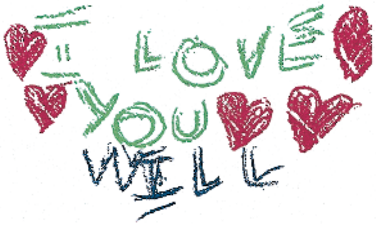
Gangs A **gang** is a cohesive social group characterized by initiation rites, distinctive colors and symbols, "ownership" of a specific territory, and feuds with one or more rival groups. Typically, gangs are governed by strict rules for behavior and stiff penalties for violations. Adolescents are particularly at risk for joining a gang, especially if someone else in their household belongs to one, if there is a lot of antisocial behavior in their neighborhood, and if their friends partake in antisocial behaviors (Gilman et al., 2014). Young people affiliate with gangs for a variety of reasons. Some do so as a way of demonstrating loyalty to their family, friends, or neighborhood. Some seek the status and prestige that gang membership brings. Some have poor academic records and perceive gang activity as an alternative means of gaining recognition for accomplishments. Many members of gangs have troubled relationships with their families or have been consistently rejected by peers, and so they turn to gangs to get the emotional support they can find nowhere else (Dishion et al., 2008; Kodluboy, 2004; Petersen, 2004).

Provide the academic, social, and emotional support that gang members need to be successful at school.

Although the prevalence of gangs present at school has declined somewhat over the past decade, gangs are still widespread (NCES, 2021). As teachers, we can make a difference in the lives of gang members in our classes (Freedman, 1990; Parks, 1995). In particular, we can make an effort to show these students that we care about them and their well-being. For instance, we can be willing listeners in times of trouble and can provide the support that gang members need to achieve both academic and social

Chapter 13 offers specific strategies for minimizing—and ideally eliminating—gang-related aggression and violence at school.

success. It is important to know something about our students' backgrounds—such as their family dynamics, economic circumstances, and cultural upbringings—so that we can better understand the issues with which they may be dealing. And we certainly must work cooperatively and proactively with our colleagues to minimize violent gang activity at school.



For many children, thoughts of romance emerge early, as 5-year-old Isabelle's artwork illustrates.

Romantic Relationships As early as the primary grades, children talk of having boyfriends or girlfriends. With the onset of adolescence, the biological changes of puberty bring on new and sometimes unsettling feelings and sexual desires. Not surprisingly, then, romance is a frequent topic of conversation in the middle and high school grades. Young adolescents' romantic thoughts may also involve crushes on people who are out of reach—perhaps favorite teachers or movie stars (Brown, 1999; Eckert, 1989; Miller & Benson, 1999).

Eventually, many adolescents begin to date, especially if their friends are dating. Adolescents use a variety of terms to describe their emerging romantic relationships, including dating, "hooking up" relationships, and friends with benefits (Baker & Carrreño, 2016; Manning et al., 2006). Early choices in dating partners are often based on physical attractiveness or social status, and dates may involve only limited and superficial interaction (Brown, 2011; Furman et al., 1999; Pellegrini, 2002). As adolescents move into the high school grades, some form more intense, affectionate, and long-term relationships; these relationships may lead to sexual intimacy—55% of U.S. adolescents have had sexual intercourse by the age of 18 (CDC, 2021; Connolly & McIsaac, 2009; Furman & Collins, 2009).

From a developmental standpoint, romantic relationships have benefits: They can address young people's needs for companionship, affection, and security, and they provide an opportunity to experiment with new social skills and interpersonal behaviors (Davila, 2008; Furman & Simon, 2008; Miller & Benson, 1999). Healthy family relationships at home are often reflected in healthy romantic relationships among adolescents (Xia et al., 2018). At the same time, romance can wreak havoc with adolescents' emotions. Adolescents have more extreme mood swings than younger children or adults, and for many this instability may be partly due to the excitement and frustration of being romantically involved or *not* involved (Davila, 2008; Furman & Collins, 2009).

As students reach high school (and occasionally earlier), a significant minority of them find themselves attracted to peers of their own sex either instead of, or in addition to, the opposite sex. Adolescence can be a particularly confusing time for individuals who are questioning their sexuality. Some struggle to make sense of their sexual orientation and may experience considerable depression. Yet many others enjoy good mental health, especially if their home and school environments communicate acceptance of diverse sexual orientations (Darwich et al., 2012; Espelage et al., 2008; Savin-Williams, 2008).

Offer emotional support when valued romantic relationships fizzle or don't materialize.

The extent to which we, as teachers, talk about sexuality with our students must be dictated, in part, by school policies and the values of the community in which we work. At the same time, especially if we're teaching adolescents, we must be aware that romantic and sexual relationships—whether real or imagined—are a considerable source of excitement, frustration, confusion, and distraction for students, and we must lend a sympathetic ear and an open mind to those students who seek our counsel and support.

Popularity and Social Isolation

When students are asked to identify their most "popular" classmates, they identify peers who have dominant social status at school (perhaps those who belong to a prestigious social group) but in many cases are aggressive or condescending (Cillessen et al., 2011; Ellis & Zarbatany, 2007; Hawley, 2014). For example, when 14-year-old Courtney was asked what the popular kids were like, she had this to say:

> Nobody likes the popular kids. We all think they're bratty, they're mean. The only reason they're popular is because they'll make out with guys at the back of the bus. . . . They don't include anyone. They have their own parties that consist only of themselves. They can't branch out.

There are downsides to popularity: Particularly during adolescence, some popular students may act somewhat aggressively toward others, sometimes as a means of maintaining their popularity (van den Berg et al., 2019). In addition, adolescents who are either very popular or very unpopular often report poorer psychological well-being than other adolescents (Ferguson & Ryan, 2019).

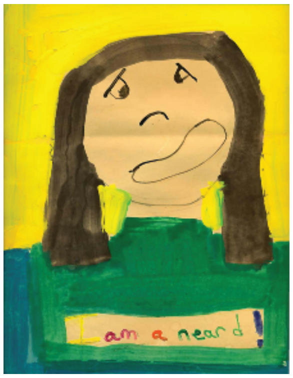
Yet contrary to Courtney's description, *truly* **popular students**—those who are well-liked and whom many classmates select as people they'd like to do things with—may or may not hold high-status positions, but they're kind, trustworthy, and socially skillful. They also tend to show genuine concern for others—for instance, by sharing, cooperating, and empathizing with peers (Asher & McDonald, 2009; Cillessen & van den Berg, 2012; Mayeux et al., 2011).

In contrast to popular students, **rejected students** are those whom classmates select as being the *least* preferred social companions. Students with few social skills—for example, those who are impulsive or aggressive—typically experience peer rejection (Asher & McDonald, 2009; Pedersen et al., 2007; Rubin et al., 2010). Students who are noticeably overweight and those who appear to be LGBTQ+ are also frequent targets of ridicule, harassment, and rejection, as are some members of racial and ethnic minority groups (Graham & Hudley, 2005; Swearer et al., 2010). Peer rejection over a lengthy period—psychologists call it *social marginalization*—can cause students considerable psychological distress and shame. To cope with such feelings and try to preserve a positive sense of self, these students may psychologically disengage from school life, jeopardizing their academic achievement as well as their social development and emotional well-being. Some begin to associate with other marginalized peers, who may or may not encourage attitudes and behaviors that will be productive over the long run (Bellmore, 2011; Ladd et al., 2012; Loose et al., 2012).

Members of a third group, **controversial students**, elicit diverse reactions, in that some peers really like them and others really *dis*like them. These students can, like some rejected students, be quite aggressive, but they also have good social skills that make them popular with at least some of their peers (Asher & McDonald, 2009; Cillessen & van den Berg, 2012; Mayeux et al., 2011). Many students whom classmates refer to as "popular" actually fall into this category.

Researchers have described a fourth category as well. **Neglected students** are those whom peers rarely choose as someone they would either most like or least like to do something with (Asher & Renshaw, 1981). Some of these seemingly overlooked students prefer to be alone, others are quite shy or don't know how to go about initiating interaction, and still others are content with having only one or two close friends (Gazelle & Ladd, 2003; Guay et al., 1999; McElhaney et al., 2008). Socially isolated students may be particularly vulnerable to being victimized by other students in classrooms in which students feel pressured to act a certain way by their peers (e.g., to be loud and disrespectful) (Guimond et al., 2018). Sometimes, "neglected" status is a temporary situation, but some students are friendless and socially marginalized for extended periods—such is often the case for recent immigrants and for students with disabilities—and these students are at higher-than-average risk for depression (Gazelle & Ladd, 2003; Igoa, 2007; Yuker, 1988).

Especially in the middle school and high school grades, most students are well aware of which peers do and don't have high social status, and some of them do



In this self-portrait, 10-year-old Sarah characterizes herself as a nerd ("neard")—that is, as someone who isn't as "cool" as she might be within her peer group.

things that aren't in their own or others' best interests—for instance, engaging in substance abuse or casual sexual intimacy—in an effort to gain or maintain membership in an allegedly "popular" group (Cillessen et al., 2011; Crosnoe, 2011). For example, they may ridicule and bully peers whom they perceive to be odd or nerdy. And they may abruptly abandon friendships that could undermine their image, as 14-year-old Courtney revealed when describing something that happened in a close-knit group of five girls:

> The five of us would hang out, sit at the same lunch table. Then Jamie became good friends with another group. They had parties, became the popular group, so Jamie left us. She had been Maggie's best friend, so Maggie was devastated. Jamie wouldn't talk to us, wouldn't even wave at us in the hallway.

Particularly during the middle school years, students are likely to want to affiliate with classmates who are perceived as being "cool," and they often avoid affiliating with peers who are perceived as low in social status (Dijkstra et al., 2013). Not all status-seeking students successfully climb to the top of the social hierarchy, of course, and their failure to do so can leave them feeling isolated, depressed, and uninterested in school achievement (Cillessen et al., 2011; Crosnoe, 2011; Somerville, 2013).

As teachers, one way that we might discourage counterproductive status-seeking behaviors is to act as *myth busters,* explicitly opening up conversations about what true popularity involves. Students often will benefit when they are able to establish a balance between "fitting in" with the crowd, and also "standing out" as an individual (Gray, 2017). For example, we might engage our students in conversations about how we, as teachers, can help them to establish such a balance. Such conversations could happen in class, or with online discussion boards or blogs.

Talk with students about what it *really* means to be popular.

We can also help offset the hard feelings that peer rejection or neglect may engender by being especially warm and attentive to socially isolated students (Crosnoe, 2011; Wentzel, 1999). In fact, when *we* show that we like particular students, their classmates are more likely to accept and act positively toward them (L. Chang, 2003; Chang et al., 2004; Hendrickx et al., 2017). We can also assist with interpersonal skills. Because of their social isolation, rejected and neglected students have fewer opportunities to develop the social skills that many of them desperately need (Coie & Cillessen, 1993; McElhaney et al., 2008; Vitaro et al., 2012).

Model positive feelings and behaviors toward rejected and neglected students, and help these students acquire good social skills.

Social Cognition

Over time, children develop the ability to consider how people are likely to think about, behave in, and react to various situations. The ability to consider others' actions is referred to as *social cognition*. Students who think regularly about other people's thoughts and feelings tend to be socially skillful and make friends easily (Bosacki, 2000; Harris, 2006; Izard et al., 2001). They also tend to be less anxious in social situations (Pearcey et al., 2021). Some researchers propose that social cognition is a distinct human ability—which they call *emotional intelligence*—whereas others believe that it's simply an integral part of people's general intellectual and social functioning (Mayer et al., 2008; Waterhouse, 2006; Zeidner et al., 2002). In any case, certain structures in the brain do seem to be dedicated to it (Spunt & Lieberman, 2013).

Perspective Taking One important element of social cognition is **perspective taking**, or looking at the world from other people's viewpoints. The following situation provides an example.

If you were the teacher in this classroom, would you be able to understand how and why these students can have such different perspectives? Would you let

Experiencing Firsthand

Different Views

Consider this scenario:

> When Mrs. Hines' third graders returned to school after having been at home for many months because of the Covid-19 pandemic, they all seemed happy to be back. The school's current policy is that all of the students and staff are required to wear masks. One of the children in the class, Zoey, does not like wearing a mask. When Mrs. Hines reminds her to put on her mask, she tears up and becomes visibly upset. Aria and Elijah are two other students in the class. During lunch, they have a brief conversation about Zoey:

Aria: Zoey is such a baby. Why does she whine like that every day? We all have to wear the masks, and so does she. I wish she'd get over it.

> Elijah: Yeah but I think it really bothers her, she said it itches her skin. Nobody forces us to wear hats when it's cold out, so she shouldn't be forced to wear a mask.
> Aria: But what if she got sick? She could make the rest of us sick.
> Elijah: Well we can just stay a few feet away from her, that's easy to do. What's the big deal?

your own feelings about masks affect how you might help Aria and Elijah to work through this situation? To answer these questions, you must look at the situation from the perspectives of all three children—Aria, Elijah, and Zoey. Aria and Elijah see the situation differently, but that does not mean that one of them is wrong and one is right. In addition, it's important to consider Zoey's perspective, too. Zoey may find the mask to be truly uncomfortable or have a medical reason as to why she struggles with wearing a mask; Zoey might also be influenced by her parents' attitudes. As the teacher, Mrs. Hines may be in a difficult situation: She needs to enforce the school's mask policies, but she also probably wants to help her students to understand each other's perspectives.

Brain research indicates that, to some degree, we may be "prewired" to look at situations from other people's perspectives as well as our own. In particular, certain neurons in the brain, known as **mirror neurons**, fire either when a person is performing a particular behavior *or* when the person watches *someone else* perform that behavior. Some of these mirror neurons are involved both in feeling certain emotions—perhaps disgust or anguish—and in observing such emotions in others' facial expressions (Gallese et al., 2011; Rizzolatti & Sinigaglia, 2008; Spaulding, 2013).

As children grow older, most develop and increasingly refine a **theory of mind**—a self-constructed understanding of their own and others' thoughts, beliefs, feelings, and motives. As children's theories of mind develop, they become better able to appreciate diverse perspectives. The development of a theory of mind is related to the types of experiences that children encounter, as well as to maturation in the prefrontal cortex of the brain—a part of the brain that continues to mature over the course of childhood and adolescence (Imuta et al., 2016; Liu et al., 2009; Steinberg, 2009).

As a result of experience, cognitive development, and brain maturation, children gain an increasingly complex understanding of human thought processes and feelings as they grow older, enabling them to become more effective in interacting with others and in understanding others' perspectives (Tamnes et al., 2018).

Childhood. Consistent with what we know about cognitive development, young children tend to focus on other people's concrete, observable characteristics and behaviors. However, they do have some awareness of other people's inner worlds. As early as age 4 or 5, they realize that what *they* know may be different from what *other people* know (Wellman et al., 2001; Wimmer & Perner, 1983). They also have some ability to make inferences about other people's mental and emotional states—for instance, to deduce that people who behave in certain ways have particular intentions or feelings (Harris, 2006; Imuta et al., 2016; Schult, 2002; Wellman et al., 2000). As children progress through the elementary grades, they also begin to understand that people's actions don't always reflect their thoughts and feelings—for instance, that someone who appears to be happy may actually feel sad (Flavell et al., 2002; Selman, 1980). Research also indicates that children's experiences affect the development of the abilities to understand others' behaviors. Some children from lower income backgrounds do not develop theories of mind at the same rates as more affluent children; this can inhibit their ability to understand the roles of teachers in schools, and thus may adversely affect their achievement at school (Cavadel & Frye, 2017).

Early adolescence. Most young adolescents realize that people can have mixed feelings about events and other individuals (Flavell & Miller, 1998; Harter & Whitesell, 1989; Weimer et al., 2021). They also become capable of **recursive thinking** (Oppenheimer, 1986; Perner & Wimmer, 1985), that is, they can think about what other people might be thinking about them and eventually can reflect on other people's thoughts about them through multiple iterations (e.g., "You think that I think that you think . . ."). This isn't to say that adolescents (or adults, for that matter) always use this capacity. Consistent with our earlier discussion of the *imaginary audience,* focusing primarily on one's *own* perspective is a common phenomenon in the early adolescent years (Tsethlikai & Greenhoot, 2006; Tsethlikai et al., 2007).

When students seem focused only on their own points of view, encourage them to consider why others might reasonably think and behave as they do.

Late adolescence. During high school, adolescents are able to draw upon their knowledge, their personal experiences, their peers' behaviors and experiences, and their personal beliefs and traditions as they consider how other people think about various situations (Conson et al., 2017; Eisenberg et al., 1995; Selman, 1980; Van der Graaff et al., 2014). Compared to children and early adolescents, older adolescents are more likely to acknowledge that other people might think about issues differently than they do. This burgeoning ability to more critically consider other people's perspectives allows educators to more readily engage their students in discussions about issues that don't necessarily have a right or a wrong answer. It's also important to note that adolescents who are farther along in their ability to appreciate diverse perspectives may be less likely to engage in risky behaviors (such as using drugs or alcohol, texting while driving, or having unsafe sexual contact), since they can more carefully consider potential negative consequences.

Regularly ask students to reflect on other people's thoughts, feelings, and motives.

Social Reasoning and Social Information Processing Children and adolescents have a lot to think about when they consider what other people are thinking, feeling, and doing. **Social reasoning** refers to the mental processes involved in thinking and reasoning about various social situations. Social reasoning may include thoughts about (a) how various social issues affect us as individuals, (b) societal norms about various social issues, and (c) the morality of the issue being considered (e.g., is it fair?) (Harvey et al., 2001; Turiel, 1983). More generally, the mental processes involved in understanding and responding to social events are collectively known as **social information processing** (e.g., Burgess et al., 2006; Fontaine et al., 2008; Smith & Semin, 2007). Social information processing involves paying *attention* to certain behaviors in a social situation and trying to *interpret* and make sense of those behaviors. For example, when students interact with classmates, they might focus on certain remarks, facial expressions, and body language and try to figure out what a classmate really means by, say, a thoughtless comment. Students also consider one or more *goals* they hope to achieve during an interaction—perhaps preserving a friendship on the one hand, or teaching somebody a "lesson" on the other. Then, taking into account both their interpretations and their goals, students draw on their previous knowledge and experiences to identify a number of possible responses and choose what is, in their eyes, a productive course of action. As you'll see in the next section, an understanding of social information processing is especially helpful in explaining why some students are unusually aggressive toward their peers.

Promoting perspective taking. Virtually any classroom offers many opportunities for perspective taking. One strategy is to talk frequently about people's thoughts, feelings, and motives (Ruffman et al., 2002; Wittmer & Honig, 1994; Woolfe et al., 2002). In the process, we must, of course, use age-appropriate language. With first graders, we might use such words as *think, want,* and *sadness.* With fifth graders, we might talk about *misunderstanding, frustration,* and *mixed feelings.* Most high school students have the cognitive and social reasoning capabilities to understand fairly abstract and complex psychological terms, such as *being passive-aggressive* and *having an inner moral compass.*

Another strategy is to take advantage of situations in which people have diverse perspectives and beliefs about a situation. For example, in times of disagreement or conflict, students and teachers alike benefit from putting themselves in the other party's shoes (Adalbjarnardottir & Selman, 1997; Gehlbach et al., 2012). When two or more students clash in the classroom or elsewhere on school grounds, an effective approach is *peer mediation,* in which specially trained peers elicit the students' differing points of view and help them reach an equitable solution (Deutsch, 1993; Johnson & Johnson, 1996, 2006). When students are at risk for engaging in risky or dangerous behaviors, encouraging them to consider other people's perspectives can help them to understand why other people might choose not to partake in a dangerous activity (Crone et al., 2008).

Chapter 10 describes peer mediation in more detail.

Opportunities for perspective taking also arise during instruction. For example, in discussions of current events, teachers might have different students—or, using the internet, same-age classes at different schools—take various countries' perspectives as they explore significant world problems, such as climate change or how to combat the Covid-19 pandemic (Gehlbach et al., 2008).

Collaborative social reasoning (CSR) is an instructional strategy that can be used to help students to understand diverse perspectives about various social issues. In CSR, students are divided into small discussion groups. The teacher initially guides the discussions, with the goal of creating a climate in which the students can have these group discussions without direct teacher involvement. Students discuss a specific issue, usually based on units that teachers are covering in class. Teachers help the students to discuss social issues in an open, mutually respectful manner, in which all perspectives are valued. In CSR discussions, students consider multiple perspectives on the topic and collaboratively come up with a group-generated solution, rather than competing with each other to offer the "best" argument. Research indicates that participating in CSR discussions is related to the development of enhanced social reasoning skills, greater acceptance by peers, decreased aggressive tendencies, increased vocabulary knowledge, and improved skills at working in groups and maintaining positive relationships with peers (Hsieh et al., 2021; Lin et al., 2019, 2021).

Chapter 7 discusses *information processing theory*, on which this concept of social information processing is based.

Karen roach/Shutterstock

Despite warnings, about 1 in 3 adolescents report texting while driving (AAFP, 2021).

Aggression

Aggression is an action intentionally taken to hurt another person either physically or psychologically. The word typically brings to mind some form of **physical aggression** (e.g., hitting, shoving), which can potentially cause bodily injury. But it may instead involve **psychological aggression**—an action intended to cause mental anguish or reduce self-esteem. In some cases, psychological aggression is specifically aimed at undermining friendships and other interpersonal relationships—perhaps by spreading unkind rumors or ostracizing someone from a valued social group—in which case it's also called **relational aggression**. As a general rule, aggression declines over the course of childhood and adolescence, but it increases for a short time after students make the transition from elementary school to middle school or junior high (Bradshaw et al., 2013; Pellegrini, 2002).

Researchers have identified two distinct groups of aggressive students (Crick & Dodge, 1996; Poulin & Boivin, 1999; Vitaro et al., 1998). Those who engage in **proactive aggression** deliberately initiate aggressive behaviors as a means of obtaining desired goals. Those who engage in **reactive aggression** act aggressively primarily in response to frustration or provocation. Of the two groups, students who exhibit proactive aggression are more likely to have trouble maintaining productive friendships (Hanish et al., 2004; Poulin & Boivin, 1999). Those who direct considerable aggression toward particular peers—whether it be physical or psychological aggression—are known as **bullies**. Bullying is more prevalent than many realize, with data suggesting that more than one in five students between the ages of 12 and 18 are bullied at school annually (NCES, 2019). Students who are overweight, underweight, immature, anxious, unpopular, or socially isolated are frequent victims of bullies, as are sexual minority students and students with disabilities (Hamovitch, 2007; Robinson & Espelage, 2012; Stopbullying.gov, 2021; Watson et al., 2005).

Some children and adolescents are genetically more predisposed to aggression than their peers, and others may exhibit heightened aggression as a result of neurological abnormalities (Brendgen et al., 2008; Odintsova et al., 2019; Pavlov et al., 2012; van Goozen et al., 2008). But environmental factors can foster aggressive behavior as well. Many aggressive students live in dysfunctional conditions at home, perhaps including frequent conflicts, harsh punishment or child maltreatment, and a lack of affection and appropriate social behavior (Christenson, 2004; Maikovich et al., 2008; Pettit, 2004). In addition, regular exposure to violence in the community or through various media (e.g., television, music, social media) seems to increase aggressive behavior in young people (Anderson et al., 2003; Guerra et al., 2003; Huesmann et al., 2003; Prot et al., 2014; Zhang et al., 2019).

It's important to note here that many children and adolescents who are routinely exposed to violence at home or elsewhere are *not* especially aggressive (Margolin & Gordis, 2004; Pearce et al. 2003). Certain cognitive and motivational factors seem to underlie aggressive behavior, including the following:

- *Poor perspective-taking ability.* Students who are highly aggressive tend to have poor social information processing skills, including a limited ability to look at situations from other people's perspectives, or to empathize with their victims (Coie & Dodge, 1998; Damon & Hart, 1988; Marcus, 1980; Smeijers et al., 2020).
- *Misinterpretation of social cues.* Students who are aggressive toward peers tend to interpret others' behaviors as reflecting hostile intentions, especially when those behaviors have ambiguous meanings. This **hostile attributional bias** is especially prevalent in children who are prone to *reactive* aggression and adolescents who are prone to *relational* aggression (Bukowski et al., 2007; Crick et al., 2002; Dodge et al., 2003; Kokkinos et al., 2017).
- *Prevalence of self-serving goals.* For most students, establishing and maintaining interpersonal relationships is a high priority. For aggressive students, however, achieving more self-serving goals—perhaps maintaining an inflated self-image, seeking revenge, or gaining power and dominance—often takes precedence (Cillessen & Rose, 2005; Menon et al., 2007; Pellegrini et al., 2011).

- *Ineffective social problem-solving strategies.* Aggressive students often have little knowledge of how to persuade, negotiate, or compromise. Instead, they often resort to hitting, shoving, or barging into play activities, and they often act on impulse, without considering the consequences of their actions (Schwartz et al., 1998; Troop-Gordon & Asher, 2005).
- *Belief in the appropriateness and effectiveness of aggression.* Many aggressive students believe that violence and other forms of aggression are acceptable ways of resolving conflicts and retaliating against others' misdeeds (Paciello et al., 2008; Watson et al., 2005; Zelli et al., 1999). Those who display high rates of *proactive* aggression are also likely to believe that aggressive action will yield positive results—for instance, that it will enhance social status at school or restore "honor" to one's family or social group (Brown et al., 2009; Mayeux et al., 2011; Pellegrini & Bartini, 2000). Not surprisingly, aggressive children tend to associate with one another, thereby confirming one another's beliefs that aggression is appropriate (Crick et al., 2009; Espelage & Swearer, 2004).

Both initiators and recipients of aggression often have problems later on. Unless adults intervene, many aggressive students (especially those who exhibit proactive aggression) show a continuing pattern of aggression and violence as they grow older, and such a pattern almost guarantees long-term maladjustment and difficulties with peers (Dodge et al., 2003; Ladd & Troop-Gordon, 2003; Swearer et al., 2010). Meanwhile, children who are frequent targets of bullying can become anxious and depressed—sometimes suicidal—and may frequently skip school or even drop out altogether (Cornell et al., 2013; Hoglund, 2007; Ladd et al., 2012). Often the psychological aggression involved in bullying—taunts, name-calling, blatant exclusion from social activities, and the like—causes more long-term harm than any physical aggression that accompanies it (Bradshaw et al., 2013; Doll et al., 2004; Goodwin, 2006). Moreover, victims of bullying sometimes feel the need to bring weapons to school (Pham et al., 2017).

Even innocent bystanders tend to suffer from the aggression they witness at school. Dropout rates tend to be higher in schools in which teachers and students observe a great deal of bullying and teasing (Cornell et al., 2013). When students observe one classmate bullying another, their own sense of safety at school diminishes (Mayer & Furlong, 2010; Rivers et al., 2009). Furthermore, if they see bullying and other aggressive behaviors going unpunished, they may come to believe that such actions are acceptable (Meyer, 2009; Miller & Prentice, 1994).

Be on the lookout for bullying and other forms of aggression, and take appropriate actions with both the victims and the perpetrators.

As teachers, we *must* intervene when some students victimize others, and we must keep a watchful eye for additional incidents of physical or psychological aggression down the road. Regular victims of aggression need social and emotional support from us and from their classmates. Some may also need one or more sessions with a school counselor, perhaps to address feelings of vulnerability and depression or perhaps to learn skills that will minimize future victimization incidents (Espelage & Swearer, 2004; Gaffney et al., 2019; Newman, 2008; Veenstra et al., 2014; Yeung & Leadbeater, 2007).

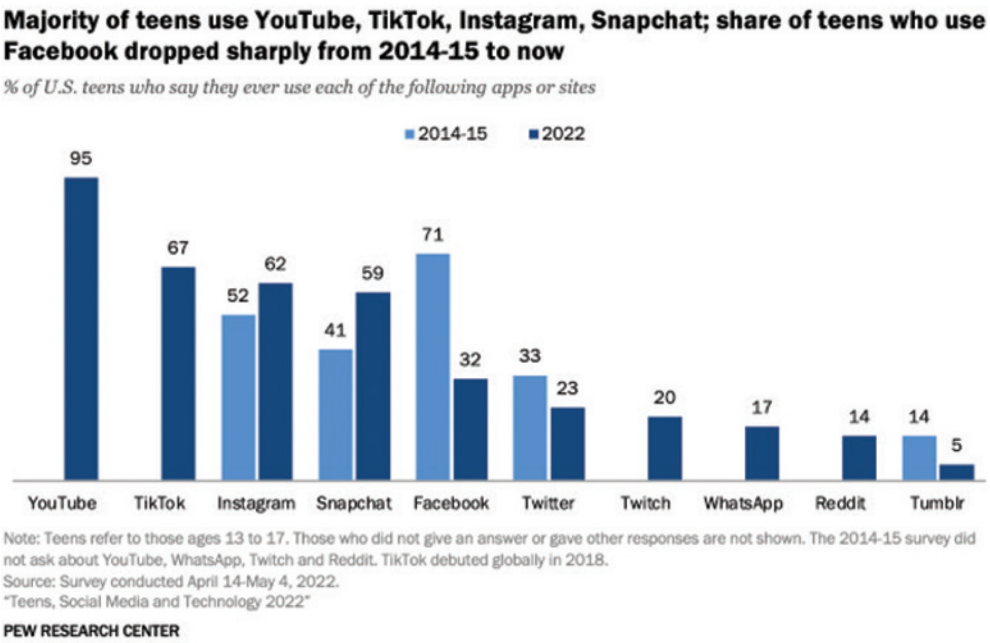
The perpetrators of aggression require intervention as well. They must be given appropriate consequences for their actions, of course, but they should also be helped to behave more appropriately. Specific strategies should be tailored to the thoughts and motives that underlie their aggression. Such strategies as encouraging perspective taking, helping students interpret social situations more accurately, teaching effective social problem-solving skills, and involving all students and school personnel are potentially useful in reducing aggression and other disruptive behaviors (Cunningham & Cunningham, 2006; Frey et al., 2009; Hazier & Carney, 2012; Guerra & Slaby, 1990; Horne et al., 2004; Hudley & Graham, 1993). Putting students in situations where they must explicitly *help*, rather than harm, others—for instance, asking them to tutor younger children—can also be beneficial (Sullivan & Conoley, 2004). Ultimately, interventions with aggressive students are most likely to be effective if schools communicate the importance of acting kindly and respectfully toward all members of the school community, teachers and students alike (Espelage & Swearer, 2004; Meyer, 2009; Parada et al., 2008; Ross & Horner, 2009).

Technology and Peer Relationships

Thanks to wireless technologies (e.g., smartphones), most students can now communicate frequently and instantaneously with their peers (Greenhow et al., 2009; Valkenburg & Peter, 2009). For example, in the United States, 95% of adolescents have access to a smartphone, and 46% report being online nearly all the time (Vogels et al., 2022). Moreover, the majority of adolescents report using more than one social network service (e.g., Instagram, Snapchat). In the United States, adolescents tend to use YouTube and Snapchat more than other services (see Figure 3.5 for a summary). Teens in other countries as well have extraordinary access to the internet and social media. For example, in China, 90% of teens are able to access the internet regularly using mobile phones (Yang, 2018), and in Australia, 93% of teens use the internet regularly to communicate with their friends (eSafety Commissioner, 2021).

Social media play important roles in the social lives of today's students. For example, 57% of adolescents indicate that they have begun a new friendship via digital technologies, and 8% of adolescents have dated someone whom they met online (Lenhart et al., 2015). And although much communication via technology occurs between only two people, chat rooms and multi-user applications such as Snapchat allow group discussions about virtually any topic. Judicious use of such mechanisms can enhance students' self-esteem, connectedness with peers, social problem solving, and general psychological well-being (Ellison et al., 2007; Greenhow et al., 2009; Gross et al., 2002; Valkenburg & Peter, 2009). But the increased use of social media can also induce stress in our students. One 15-year-old girl stated, "It makes it harder for people to socialize in real life, because they become accustomed to not interacting with people in person," and another 15-year-old girl stated that "It provides a fake image of someone's life. It sometimes makes me feel that their life is perfect when it's

Figure 3.5 Trends in social media use among teens in the United States



Majority of teens use YouTube, TikTok, Instagram, Snapchat; share of teens who use Facebook dropped sharply from 2014-15 to now

% of U.S. teens who say they ever use each of the following apps or sites

Note: Teens refer to those ages 13 to 17. Those who did not give an answer or gave other responses are not shown. The 2014-15 survey did not ask about YouTube, WhatsApp, Twitch and Reddit. TikTok debuted globally in 2018.
Source: Survey conducted April 14-May 4, 2022.
"Teens, Social Media and Technology 2022"

PEW RESEARCH CENTER

SOURCE: Pew Research Center (2022). Teens, social media and technology 2022. Washington, D.C.: Pew Research Center. Downloaded from: https://www.pewresearch.org/internet/2022/08/10/teens-social-media-and-technology-2022/

not" (Anderson & Jiang, 2018). Concerns also have been raised regarding the addictive nature of social media. In one study, researchers found an area of the human brain that is associated with rewards experiences heightened activity when adolescents observe that their peers have "liked" their Instagram posts (Sherman et al., 2018). These effects appear to be the strongest among older high school students and seem to diminish somewhat after high school.

Unfortunately, wireless technologies and the internet also provide vehicles for **cyberbullying**—electronically transmitting hostile messages, broadcasting personally embarrassing information, or in other ways causing someone significant psychological distress. For example, a student might upload humiliating video footage on YouTube, distribute malicious (and possibly false) gossip on Instagram, or set up a website on which classmates can "vote" for their class's "biggest loser" or "easiest slut" (Shariff, 2008; Valkenburg & Peter, 2009; Willard, 2007). Cyberbullying is particularly pernicious because virtually anything that is posted on the internet leaves a **digital footprint** (i.e., information or data that remains on the internet, potentially indefinitely); thus, an embarrassing photograph posted by an early adolescent to bully someone else can potentially be found many years later, even if it was subsequently deleted. Cyberbullying is quite prevalent, and it can be more harmful than face-to-face bullying, in part because the perpetrators often remain anonymous (and so can't be confronted) and in part because highly defamatory material can spread like wildfire through a large peer group (Kowalski & Limber, 2007; Rivers et al., 2011; U.S. Department of Health & Human Services, 2021a). Adolescents who identify as being LGBTQ+ are particularly vulnerable to being victims of cyberbullying (Abreu & Kenny, 2018). Although all types of bullying have been found to be related to thoughts of suicide in some adolescents, cyberbullying is more strongly related to suicidal ideation than traditional bullying (Gini & Espelage, 2014; Selkie et al., 2016). Unfortunately, cyberbullying is one form of aggression that *doesn't* seem to decline over the course of adolescence (Bradshaw et al., 2013).

Explain what cyberbullying is and why it is unacceptable.

Programs specifically designed to target and prevent cyberbullying can be quite effective and are certainly more effective at reducing cyberbullying than are more general prevention programs that broadly target violence (Polanin et al., 2021). As teachers, we must join with other faculty members and school administrators to talk with students about wise and socially appropriate uses of modern technology, and we must explain in no uncertain terms that cyberbullying in any form—whether it involves taunts, threats, unkind rumors, or any other material that can cause psychological harm to others—is *totally unacceptable*. And, of course, we must monitor students' in-class use of the internet.

Diversity in Peer Relationships and Social Cognition

Some students with disabilities have delays in the development of social cognition and, as a result, often have trouble in interpersonal relationships. For example, students with significant delays in their overall cognitive development (i.e., children with intellectual disabilities) typically have limited understanding of appropriate behaviors in social situations (Leffert et al., 2000). Students with specific learning disabilities also may experience difficulties with social interactions (Al-Yagon & Margalit, 2014). In addition, some students with seemingly normal cognitive abilities have specific deficits in social cognition. In a mild form of autism spectrum disorder, students may show average or above-average academic achievement but have great difficulty drawing accurate inferences from others' behaviors and body language, apparently as a result of a brain abnormality (Dawson & Bernier, 2007; Hobson, 2004; Tager-Flusberg, 2007). In addition, many students with chronic emotional and behavioral disabilities have poor perspective-taking and social problem-solving abilities and thus may have few, if any, friends (Espelage et al., 2004; Harter et al., 1998; Webber & Plotts, 2008).

Gender Differences Gender differences have been observed in interpersonal behaviors. In general, boys tend to hang out in large groups, whereas girls tend to favor smaller, more intimate gatherings with close friends (Maccoby, 2002). Also, girls seem to be more astute at reading other people's body language, and they work harder to maintain group harmony (Bosacki, 2000; Rudolph et al., 2005). Furthermore, aggression tends to take different forms in boys (who are prone to physical aggression) and in girls (who are more apt to engage in relational aggression, such as disrupting friendships and tarnishing others' reputations; Card et al., 2008; Crick et al., 2002; Pellegrini, 2011; Pellegrini & Archer, 2005; Tremblay & Côté, 2019). With regard to social media, which is used by many youths to communicate with their peers, girls tend to use Snapchat more than boys (Anderson & Jiang, 2018).

Cultural and Ethnic Differences Interpersonal behaviors vary from culture to culture. As classroom teachers, we need to be aware that there may be culturally based differences in how our students interact with each other and with us, and how they think about social situations. For example, some of our students' families may regularly use seemingly antisocial behaviors—especially teasing and ridicule—to teach children to remain calm and handle criticism (Rogoff, 2003). In contrast, others may place particular emphasis on interpersonal relationships and group harmony. These different ways of approaching social interactions may derive from cultural differences (Gardiner & Kosmitzki, 2008; Guthrie, 2001; Halgunseth et al., 2006; Leonard & Martin, 2013; Rubin et al., 2010). For example, in one study, researchers asked children and adults from the United States and from the Hindu Indian population to describe examples of prosocial and antisocial behaviors. When the descriptions were analyzed, the researchers found that the U.S. participants often referred to personal characteristics of individuals as the causes of these behaviors (e.g., someone donates to a food drive because that person is kind), whereas the Hindu Indian participants often referred to contextual influences (e.g., someone donates to a food drive because there is a great need for donations in that community) (Miller, 1986; Miller et al., 2018). Many cultural groups place particular emphasis on group harmony and consideration of others' perspectives. Children from these backgrounds may be especially adept at negotiation and peace making (Gardiner & Kosmitzki, 2008; Guthrie, 2001; Halgunseth et al., 2006; Leonard & Martin, 2013; Rubin et al., 2010).

Before you reprimand a student for a behavioral infraction, consider whether the behavior may be rooted in cultural differences.

Promoting Healthy Peer Relationships

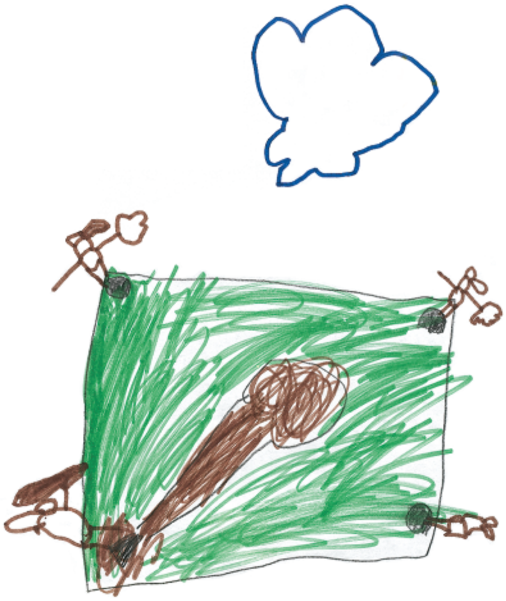
As teachers, we're in an excellent position to assess how students think about and behave in social situations and to help them interact more effectively with others. Following are several strategies that research has shown to be effective.

- *Provide regular opportunities for social interaction and cooperation.* Some instructional strategies require considerable student interaction. Assignments and activities that require students to work cooperatively to achieve a common goal can foster leadership skills and a willingness to both help and get help from peers (Certo, 2011; Ladd et al., 2014; Li et al., 2007). Activities in which students communicate with one another online—for instance, by posting their ideas and questions about classroom topics on a class website—can be especially valuable for students who are shy or who feel uncomfortable communicating with peers in a more public fashion (Hewitt & Scardamalia, 1998; Redekopp & Bourbonniere, 2009).

  A typical school day also includes many occasions in which students can interact in less structured ways. For example, during recess, students' play activities can promote cooperation, sharing, perspective taking, and conflict resolution skills (Coplan & Arbeau, 2009; Jarrett, 2002). And before and during class, students often talk and joke with peers who are seated nearby. Accordingly, we might frequently change assigned seating arrangements so that students can get to know other classmates better and perhaps discover common interests (van den Berg et al., 2012).

- *Help students interpret social situations accurately and productively.* When students consistently have trouble getting along with peers, explicit training in social cognition can make a difference. Effective interventions are likely to involve a series of training sessions—sometimes over a lengthy time period—in which, through role-playing and similar activities, students practice making inferences about other people's intentions and identifying appropriate courses of action. Students also learn strategies for reminding themselves of how to behave in various situations—for example, "When I don't have the information to tell what he meant, I should act as if it were an accident" (Hudley & Graham, 1993, p. 128). Such interventions can significantly reduce the degree to which students perceive hostile intentions in others or endorse aggressive retaliation in response to peers' behaviors (Dodge, Godwin, & The Conduct Problems Prevention Research Group, 2013; Hudley & Graham, 1993).

- *Balance students' desires to be with their friends with opportunities to meet and interact with new peers.* There are benefits to students being able to be in classes with their friends. For example, some research suggests that among elementary school students, absenteeism is lower when students have a lot of familiar faces in their classes from the previous school year, both unexcused and chronic absenteeism is lower (Kirksey & Gottfried, 2018). Furthermore, shy students may participate in small-group activities more if they have a friend in the group (Chen et al., 2021).



Extracurricular activities can promote productive peer relationships and general "team spirit." They can also be a source of success for students who struggle with academic tasks. Here 7-year-old Danny, who has a learning disability, expresses his love of baseball.

- *Teach specific social skills, provide opportunities for students to practice them, and give feedback.* The vast majority of children and adolescents want to have positive interactions with their age-mates and make friends with peers (Ladd et al., 2012; Ryan & Shim, 2008). Because we teachers spend so much time with growing children, we're in an excellent position to teach them social skills that they haven't acquired on their own—for instance, how to cooperate with others, say "no" in tactful ways, and amicably resolve conflicts. We can teach students appropriate ways of interacting with others both through explicit verbal instructions and through modeling desired behaviors. Such instruction is especially effective when we also ask students to practice their newly learned social skills (perhaps through role-playing) and give them concrete feedback about how they're doing (Bierman & Powers, 2009; García-Carrión et al., 2019; Leaf et al., 2012; Watkins & Wentzel, 2008).

- *Promote understanding, communication, and interaction among diverse groups.* Even when students have good social skills, many of them interact almost exclusively within small, close-knit groups, and a few others remain socially isolated. For example, students often divide themselves along ethnic lines when they eat lunch and interact in the schoolyard. In fact, ethnic segregation *increases* once students reach the middle school grades. As young adolescents from ethnic minority groups begin to look closely and introspectively at issues of racism and ethnic identity, they often find it helpful to compare experiences and perspectives with other group members. Ethnic stereotypes and prejudices can also contribute to this self-imposed segregation (Brown et al., 2008; Cohen & Garcia, 2008; Lin et al., 2019; Ogbu, 2008b; Tatum, 1997).

  Yet when students from diverse groups interact regularly—and especially when they come together as equals, work toward a common goal, and see themselves as members of the same team—they're more likely to accept and value one another's differences (Hodson, 2011; Oskamp, 2000; Pfeifer et al., 2007). The Creating a Productive Classroom Environment box "Encouraging Positive Interactions

Among Diverse Individuals and Groups" offers several strategies for expanding students' friendship networks.

- *Explain what bullying is and why it cannot be tolerated.* Students and teachers often have misconceptions about bullying. For instance, they may think it always involves physical aggression, even though psychological forms of aggression—such as name-calling, sexual harassment, deliberate social exclusion, defamatory social media postings, and mean-spirited text messages—constitute bullying as well. Another common misconception is that the victims of bullies somehow deserve what they get, perhaps because they display immature behaviors or need to "toughen up" and learn to defend themselves. Thus, many students condone bullying and act as a supportive audience for the perpetrators (Salmivalli & Peets, 2009; Swearer et al., 2010). Teachers who refuse to intervene when they see or hear about bullying and harassment indirectly communicate the message that such behaviors are acceptable (Buston & Hart, 2001; Juvonen & Galván, 2008; Veenstra et al., 2014). Bullying can be prevented when all school personnel work collaboratively to address bullying, when prevention efforts are targeted to meet the various roles that students play in bullying (e.g., perpetrators, victims, and bystanders), and when teachers respond immediately and consistently to acts of bullying (Gaffney et al., 2021; Nickerson, 2019; U.S. Department of Health & Human Services, 2021b).

Regularly remind students throughout the school year about what bullying is, and why it is unacceptable.

Creating a Productive Classroom Environment

Encouraging Positive Interactions Among Diverse Individuals and Groups

- **Set up situations in which students can form cross-group friendships.**

  To help her students get to know a greater number of their peers, a junior high school science teacher gives them assigned seats in her classroom and changes the seating chart once a month. She also decides how students will be paired for weekly lab activities.

- **Minimize or eliminate barriers to social interaction.**

  Students in a third-grade class learn basic words and phrases in American Sign Language so that they can work and play with a classmate who is deaf.

- **Encourage and facilitate participation in extracurricular activities, and take steps to ensure that no single group dominates in membership or leadership in any particular activity.**

  When recruiting members for the scenery committee for the eighth grade's annual class play, the committee's teacher–adviser encourages both "popular" and "unpopular" students to participate. Later, he divides the workload in such a way that students who don't know one another well must work closely and cooperatively.

- **As a class, discuss the undesirable consequences of intergroup hostilities.**

  A high school English teacher in a low-income, inner-city school district uses a lesson on Shakespeare's *Romeo and Juliet* to initiate a discussion about an ongoing conflict between two rival ethnic-group gangs in the community. "Don't you think this family feud is stupid?" she asks her students, referring to Shakespeare's play. When they agree, she continues, "The Capulets are like the Latino gang, and the Montagues are like the Asian gang. . . . Don't you think it's stupid that the Latino gang and the Asian gang are killing each other?" The students immediately protest, but when she presses them to justify their thinking, they gradually begin to acknowledge the pointlessness of a long-standing rivalry whose origins they can't even recall.

- **Develop nondisabled students' understanding of students with disabilities, *provided that* the students and their parents give permission to share what might otherwise be confidential information.**

  In a widely publicized case, Ryan White, a boy who had contracted AIDS from a blood transfusion, met considerable resistance against his return to his neighborhood school because parents and students thought he might infect others. After Ryan's family moved to a different school district, school personnel actively educated the community about the fact that AIDS doesn't spread through casual day-to-day contact. Ryan's reception at his new school was overwhelmingly positive. Later, Ryan described his first day at school: "When I walked into classrooms or the cafeteria, several kids called out at once, 'Hey, Ryan! Sit with me!'"

SOURCES: Certo et al., 2003; Connor & Baglieri, 2009; Dilg, 2010; Feddes et al., 2009; Feldman & Matjasko, 2005; Freedom Writers, 1999, p. 33 (Shakespeare example); Mahoney et al., 2003; Martin & Dowson, 2009; Modecki et al., 2018; Schofield, 1995; Schultz et al., 2000; Sleeter & Grant, 1999; Tatum, 1997; Thompson & Grace, 2001 (school play example); van den Berg et al., 2012; White & Cunningham, 1991, p. 149 (Ryan White example).

Some strategies used to address bullying, although well-intentioned, do not deter bullying; these include the use of zero-tolerance policies, conflict resolution/peer mediation (because bullying is not a "conflict," it's much more serious than that), and short-term simple "band aid" approaches to stopping bullying (U.S. Department of Health & Human Services, 2021b).

Earlier in the chapter, we authors urged you to be on the lookout for incidents of bullying. This is easier said than done, because many incidents of bullying occur beyond the watchful eyes of educators (Carter & Doyle, 2006; Swearer et al., 2010). It's important, then, that *students* learn about the many forms bullying can take and the truly harmful effects it can have on its victims. One simple strategy is to use the mnemonic *PIC* to describe what bullying involves:

- **P**urposeful behavior—"He meant to do it."
- **I**mbalanced—"That's not fair, he's bigger."
- **C**ontinual—"I'm afraid to enter the classroom because she's always picking on me." (Horne et al., 2004, pp. 298–299)

We can also teach students strategies to use when they're being bullied (e.g., they might walk away or respond with a humorous come-back) or when they observe others being victimized (e.g., they might say "Stop, you're being disrespectful" and escort the victim from the scene) (Juvonen & Galván, 2008; Ross & Horner, 2009). In general, through our school policies and day-to-day actions, all students must learn that bullying is *never acceptable* and that there will be serious consequences for engaging in or encouraging it (Ansary et al., 2015; Thapa et al., 2013).

Teach students effective strategies for responding to bullies.

Help change the reputations of formerly antisocial students. Unfortunately, students' bad reputations often live on long after their behavior has changed for the better, and thus their classmates may continue to dislike and reject them (Bierman et al., 1987; Caprara et al., 2007; Juvonen & Weiner, 1993). So, when we work to improve the behaviors of aggressive and other antisocial students, we must work to improve their reputations as well. For example, we might encourage their active involvement in extracurricular activities or place them in structured cooperative learning groups where they can use their newly developed social skills. We should also demonstrate through our words and actions that *we* like and appreciate them, as our attitudes are apt to be contagious (Chang, 2003; Chang et al., 2004).

Underlying our behaviors as teachers should be the message that *anyone can change for the better*. For instance, students can more easily forgive a former bully if they learn that the classmate's behaviors did *not* reflect innate nastiness or some other permanent personality flaw—that, instead, those behaviors were due to temporary factors that have now been resolved (Yeager & Dweck, 2012). In one way or another, we must help students discover that previously antisocial classmates have changed and are worth getting to know better.

Create a general climate of respect for others. Teachers who effectively cultivate productive student interactions and friendships also communicate a more general message: We must all have compassion for and respect one another as human beings. Fernando Arias, a high school vocational education teacher, once put it this way:

> In our school, our philosophy is that we treat everybody the way we'd like to be treated. . . . Our school is a unique situation where we have pregnant young ladies who go to our school. We have special education children. We have the regular kids, and we have the drop-out recovery program . . . we're all equal. We all have an equal chance. And we have members of every gang at our school, and we hardly have any fights, and there are close to about 300 gangs in our city. We all get along. It's one big family unit it seems like. (Turnbull et al., 2000, p. 67)

Compassion and respect for one another's rights and needs are aspects of students' moral and prosocial development, a domain to which we turn now.

Moral and Prosocial Development

Learning Objective 3.4 Describe typical advancements in moral and prosocial development over the course of childhood and adolescence, and identify strategies for promoting moral and prosocial development at school.

Behavior aimed at benefiting others more than ourselves is referred to as **prosocial behavior**. Prosocial behaviors—plus such traits as honesty, fairness, and concern about other people's rights and welfare—fall into the domain of **morality**. By and large, students who think and behave in moral and prosocial ways gain more support from their teachers and peers and, as a result, achieve greater academic and social success over the long run (Caprara et al., 2000; Spinrad & Eisenberg, 2009).

Morality and prosocial behavior are complex entities that appear to involve multiple parts of the brain. Certainly, the mirror neurons mentioned earlier are involved, as they partially underlie people's ability to look at situations from someone else's perspective. But ultimately moral and prosocial actions also have components that involve distinctly different brain regions, including (a) *emotions* (e.g., affection and concern for others); (b) *complex reasoning abilities* (e.g., logically determining what actions are morally right and wrong); and (c) *implicit values and beliefs* (e.g., immediately "knowing" that an action is morally wrong but without having a good explanation as to why) (Dinh & Lord, 2013; Gallese et al., 2011; Moll et al., 2007; Young & Saxe, 2009).

Developmental Trends in Morality and Prosocial Behavior

Most children behave more morally and prosocially as they grow older. Table 3.4 describes the forms that morality and prosocial behavior are apt to take at various grade levels. Some entries in the table reflect the following developmental trends.

- *Even very young children use internal standards to evaluate behavior.* Well before their first birthday, children show that they value prosocial behavior over antisocial behavior. In fact, even infants display evidence of an emerging sense of what is right and what is wrong (Van de Vondervoort & Hamlin, 2018). Researchers at Yale University have developed clever experiments in which infants watch cartoons or puppet shows in which one character acts kindly or unkindly toward another character. Through multiple studies, they have shown that when the infants are then presented with those characters (e.g., in the form of a toy or a doll), the infants usually reach for the "kind" character (Hamlin & Wynn, 2011; Scola et al., 2015). The researchers suggest that even infants show preferences for individuals who behave kindly toward others, compared to those who do not appear to treat others well (Hamlin & Wynn, 2011). By age 3, children have some understanding that behaviors causing physical or psychological harm are inappropriate (Helwig et al., 2001), and by age 4, most children understand that causing harm to another person is wrong regardless of what authority figures might tell them and regardless of what consequences certain behaviors may or may not bring (Laupa & Turiel, 1995; Smetana, 1981; Tisak, 1993).
- *Children's capacity to respond emotionally to others' harm and distress increases over the school years.* Within the first two or three years of life, two emotions important for moral development emerge (Kochanska et al., 2002; Lewis & Sullivan, 2005). First, children occasionally show **guilt**—a feeling of discomfort when they know they've inflicted damage or caused someone else pain or distress. They also feel **shame**—a feeling of embarrassment or humiliation when they fail to meet their own or other people's standards for moral behavior. Both guilt and shame, although unpleasant emotions, are good signs that children are developing a sense of right and wrong and will work hard to correct their misdeeds (Eisenberg, 1995; Harter, 1999; Narváez & Rest, 1995).

hopes
goals
dreams
happiness
    broken
    destroyed
    eliminated
    exterminated
no steps forward
no evolution
no prosperity
no hope
But
maybe
perhaps
except
if we
help
together
we stand
a chance.

In this poem, Matt, a middle school student, shows empathy for victims of the Holocaust.

DEVELOPMENTAL TRENDS

Table 3.4 Moral Reasoning and Prosocial Behavior at Different Grade Levels

Grade Level	Age-Typical Characteristics	Example	Suggested Strategies
K–2	• Emerging awareness that behaviors causing physical or psychological harm are morally wrong • Guilt and shame about misbehaviors that cause obvious harm or damage • Some empathy for, as well as attempts to comfort, people in distress • Appreciation for the need to be fair • Increased prosocial behaviors when exposed to gratitude • Moral beliefs can be influenced by adults' opinions.	When Jake pushes Otis off the ladder of a playground slide, several classmates are horrified. One child shouts, "That's wrong!" and three others rush to Otis's side to make sure he's not hurt.	Make standards for behavior very clear. When students misbehave, focus on the harm and distress they have caused others. Encourage students to comfort others in times of distress. Model sympathetic responses. Keep in mind that some selfish behavior is typical for the age group; when it occurs, encourage perspective taking and prosocial behavior.
3–5	• Knowledge of social conventions for appropriate behavior • Growing appreciation for cooperation and compromise • Growing realization that fairness doesn't necessarily mean equality • Growing realization that truth vs. lying are nuanced concepts that vary depending on situations • Increased desire to help others as an objective in and of itself; feelings of regret when children fail to act prosocially	At the suggestion of his third-grade teacher, 8-year-old Alan acts as a "special friend" to Hank, a boy with severe physical and cognitive disabilities who joins the class for two or three days a week. Hank can't speak, but Alan gives him things to feel and manipulate and talks to him whenever class activities allow conversation. The two boys regularly sit together at lunch. Alan comments, "Doing things that make Hank happy makes me happy, too."	Make prosocial behaviors (e.g., sharing, helping others) a high priority in the classroom. Explain how students can often meet their own needs while helping others. Use prosocial adjectives (e.g., *kind, helpful*) when praising altruistic behaviors.
6–8	• Growing awareness that some rules and conventions are arbitrary; in some cases accompanied by resistance to these rules and conventions • Interest in pleasing and helping others, but with a tendency to oversimplify what "helping" requires • Tendency to believe that people in need are responsible for their own fate	After the winter break, 13-year-old Brooke returns to school with several large nose rings and her hair styled into long, vertical spikes above her head. The principal tells her that her appearance is inappropriate and insists that she go home to make herself more presentable. Brooke resists, claiming, "I have a right to express myself however I want!"	Talk about how rules enable classrooms and other groups to run more smoothly. Involve students in group projects that will benefit their school or community. When imposing discipline for moral transgressions, accompany it with explanations about the harm that has been caused.
9–12	• Increasing concern about doing one's duty and abiding by the rules of society, rather than simply pleasing certain authority figures • Realization that most rules and conventions serve useful purposes • Genuine empathy for people in distress • Belief that society has an obligation to help people in need	Several high school students establish a school chapter of Amnesty International, an organization dedicated to the preservation of human rights. The group invites knowledgeable guest speakers from various countries and conducts several fundraisers to help combat abusive practices against women.	Explore moral issues in social studies, science, and literature. Encourage community service as a way of engendering a sense of commitment to helping others. Ask students to reflect on their experiences in class. Have students read autobiographies and other forms of literature that depict heroic figures who have actively worked to help people in need.

SOURCES: Eisenberg, 1982; Eisenberg & Fabes, 1998; Farver & Branstetter, 1994; Flanagan & Faison, 2001; Gibbs, 1995; Gummerum et al., 2008; Hart & Fegley, 1995; Hastings et al., 2007; Helwig & Jasiobedzka, 2001; Helwig et al., 2001; Hoffman, 2000; Kohlberg, 1984; Krebs & Van Hesteren, 1994; Kurtines et al., 1995; Laupa & Turiel, 1995; Lewis & Sullivan, 2005; Li et al., 2019; Ma et al., 2011; >Nucci, 2009</BIB; Nucci & Weber, 1995; Rothbart, 2011; Rushton, 1980; Shoshani et al., 2020; Smetana & Ball, 2019; Smetana & Braeges, 1990; Spinrad & Eisenberg, 2009; Turiel, 1983, 1998; Uprichard & McCormack, 2019; Wainryb et al., 2005; Yates & Youniss, 1996; Yau & Smetana, 2003; Youniss & Yates, 1999;, Zahn-Waxler et al., 1992.

Guilt and shame are the result of doing something wrong. In contrast, **empathy**—experiencing the same feelings as someone in unfortunate circumstances—appears in the absence of wrongdoing. Although the mirror neurons mentioned earlier may to some degree underlie human beings' ability to empathize, this ability continues to develop throughout childhood and adolescence (Eisenberg et al., 1995; Rizzolatti & Sinigaglia, 2008; Spinrad & Eisenberg, 2009). When empathy also evokes **sympathy**—whereby children not only assume another person's feelings but also have concerns for the individual's well-being—it tends to spur prosocial behavior (Batson, 1991; Eisenberg & Fabes, 1998; Malti et al., 2009).

- *Children increasingly distinguish between moral and conventional transgressions.* Virtually every culture discourages some behaviors—**moral transgressions**—because they cause damage or harm, violate human rights, or run counter to basic principles of equality, freedom, or justice. A cultural group typically also discourages certain other behaviors—**conventional transgressions**—that, although not unethical, violate widely held understandings about how one should act (e.g., children shouldn't talk back to adults or burp at meals). Conventional transgressions are usually specific to a particular culture; in contrast, many moral transgressions are universal across cultures (Nucci, 2009; Smetana, 2006; Turiel, 2002).

Children's awareness of social conventions increases throughout the elementary school years (Helwig & Jasiobedzka, 2001;Nucci & Nucci, 1982). But especially as children reach adolescence, they don't always agree with adults about which behaviors constitute moral transgressions, which ones fall into the conventional domain, and which ones are simply a matter of personal choice. Hence, many adolescents resist rules they think are infringements on their personal choices—for instance, rules about clothing or hair style (Nucci, 2009; Smetana, 2005).

- *With age, reasoning about moral issues becomes increasingly abstract and flexible.* To probe children's thinking about moral issues, researchers sometimes present **moral dilemmas**, situations in which two or more people's rights or needs may be at odds and for which there are no clear-cut right or wrong responses. The scenario in the following exercise is an example.

Experiencing Firsthand

Jordan's Plight

Imagine that you're a student in the ninth grade. You're walking quickly down the school corridor on your way to your math class when you see three boys from the so-called "popular" crowd cornering a small, socially awkward boy named Jordan. The boys first make fun of Jordan's thick glasses and unfashionable clothing, then they start taunting him with names such as "nerd" and "retard." What do you do?

a. You look the other way, pretending you haven't heard anything, and hurry on to class. If you were to stop to help, the boys might taunt you as well, and that will only make the situation worse.

b. You shoot Jordan a sympathetic look and then head to class so that you won't be late. Afterward, you anonymously report the incident to the principal's office, because you know that the boys' behaviors have violated your school's antibullying policy.

c. You stop and say, "Hey, you jerks, cut it out! Jordan's a really nice guy and doesn't deserve your insulting labels. Come on, Jordan, let's go. We might be late for math class, so we need to hurry."

Looking for the moral high ground in this situation, you might very well have chosen Alternative *c*. But if you were a ninth grader—someone who might still be working hard to fit in with your peer group—is that *really* what you would do?

Lawrence Kohlberg developed one of the earlier theories of moral development. He gave children and adults a variety of moral dilemmas and asked them both what they would do in each situation, and why they would do it. Based on the responses, Kohlberg proposed that as children grow older, they construct increasingly complex views of morality. In Kohlberg's view, development of moral reasoning is characterized by a sequence of six stages grouped into three general *levels* of morality: preconventional, conventional, and postconventional (see Table 3.5). Children with **preconventional morality** haven't yet adopted or internalized society's conventions regarding right and wrong, but instead focus largely on external consequences that certain actions might bring to themselves, as illustrated in Alternative *a* in the exercise. Kohlberg's second level, **conventional morality**, is characterized by general, often unquestioning obedience either to an authority figure or to established rules and norms, even when there are no consequences for disobedience. Alternative *b* in the exercise is an example: You

COMPARE/CONTRAST

Table 3.5 The Three Levels and Six Stages of Moral Reasoning in Kohlberg's Theory of Moral Development

Level	Age Range	Stage	Nature of Moral Reasoning
Level I: Preconventional morality	Seen in preschool children, most elementary school students, some middle school students, and a few high school students	Stage 1: Punishment-avoidance and obedience	People make decisions based on what is best for themselves, without regard for others' needs or feelings. They obey rules only if established by more powerful individuals; they may disobey if they aren't likely to get caught. "Wrong" behaviors are those that will be punished.
		Stage 2: Exchange of favors	People recognize that others also have needs. They may try to satisfy others' needs if they can satisfy their own needs at the same time. They continue to define right and wrong primarily in terms of consequences to themselves.
Level II: Conventional morality	Seen in a few older elementary school students, some middle school students, and many high school students (Stage 4 typically does not appear before high school)	Stage 3: Good boy/good girl	People make decisions based on what will please others, especially authority figures (e.g., teachers, popular peers). They are concerned about maintaining relationships through sharing, trust, and loyalty, and they consider other people's perspectives and intentions when making decisions.
		Stage 4: Law and order	People look to society as a whole for guidelines about right and wrong. They know that rules are necessary for keeping society running smoothly and believe that it's their duty to obey the rules. However, they perceive rules to be inflexible; they don't necessarily recognize that as society's needs change, rules should change as well.
Level III: Postconventional morality	Rarely seen before college (Stage 6 is extremely rare even in adulthood)	Stage 5: Social contract	People recognize that rules represent agreements among many individuals about appropriate behavior. Rules are seen as useful mechanisms that maintain the social order and protect individual rights, rather than as absolute dictates that must be obeyed simply because they are the law. People also recognize the flexibility of rules; rules that no longer serve society's best interests can and should be changed.
		Stage 6: Universal ethical principles	Stage 6 is a hypothetical, ideal stage that few people ever reach. People in this stage adhere to a few abstract, universal principles (e.g., equality of all people, respect for human dignity, commitment to justice) that transcend specific norms and rules. They answer to a strong inner conscience and willingly disobey laws that violate their own ethical principles.

SOURCES: Colby & Kohlberg, 1984; Colby et al., 1983; Kohlberg, 1984, 1986; Reimer et al., 1983; Snarey, 1995; Van de Vondervoort & Hamlin, 2017.

report a violation of school rules to school authorities, but you don't want to be late to class—that would violate another school rule—and through your actions you don't jeopardize any good relationships you might have with the supposedly "popular" boys.

In contrast to the somewhat rigid nature of conventional morality, people at Kohlberg's third level, **postconventional morality**, view rules as useful but changeable mechanisms that ideally can maintain the general social order and protect human rights and safety; rules aren't absolute dictates that must be obeyed without question. These people live by their own abstract principles about right and wrong and may disobey rules inconsistent with these principles. Alternative *c* has an element of postconventional reasoning: You're more concerned about protecting Jordan's physical and psychological safety than you are about getting to class on time.

Some more recent research supports Kohlberg's proposed sequence: Generally speaking, people seem to make advancements in the order Kohlberg proposed (Boom et al., 2001; Colby & Kohlberg, 1984; Snarey, 1995; Stewart & Pascual-Leone, 1992). And as Kohlberg suggested, moral development emerges out of children's own, self-constructed beliefs—beliefs they often revisit and revise over time. Nevertheless, his theory has several weaknesses. For one thing, Kohlberg underestimated young children, who, as you discovered earlier, acquire some internal standards of right and wrong long before they reach school age (e.g., Killen & Smetana, 2015). Also, Kohlberg's stages encompassed a mixture of moral issues (e.g., causing harm) and social conventions (e.g., having rules to help society run smoothly), but as we've seen, children distinguish between these two domains, and their views about each domain may change at different times and in different ways (Nucci, 2001, 2009). Furthermore, Kohlberg's theory pays little attention to a second important aspect of morality—*showing compassion for and helping* other people—and its focus is largely on *reasoning*, with little consideration of people's moral *behaviors* (Gilligan, 1982, 1987; Hill & Roberts, 2010; Miller, 2007). Finally, Kohlberg largely overlooked situational factors that young people take into account when deciding what's morally right and wrong in specific contexts (more about these factors in a moment).

Many contemporary researchers believe that moral reasoning involves general *trends* rather than distinct stages. These trends emerge as a result of both children's ongoing cognitive development and their observations of the ways that other people behave in social situations. It appears that children and adolescents gradually construct several different standards that guide their moral reasoning and decision making in various situations. Such standards include the need to address one's own personal interests, consideration of other people's needs and motives, a desire to abide by society's rules and conventions, and, perhaps eventually, an appreciation for abstract ideals regarding human rights and society's overall needs (Killen & Smetana, 2008; Krebs, 2008; Rest et al., 1999). With age, children increasingly apply more advanced standards, but even a fairly primitive one—satisfying one's own needs without regard for others—may occasionally take priority (Rest et al., 1999; Turiel, 1998).

- *As children get older, they increasingly behave in accordance with their self-constructed moral standards, but other factors come into play as well.* On average, children and adolescents with more advanced moral reasoning and a more advanced theory of mind behave in more moral and prosocial ways (e.g., Imuta et al., 2016; Miller et al., 1996; Paciello et al., 2008). However, the relationship between moral reasoning and moral behavior isn't an especially strong one. Children's perspective-taking ability and emotions (e.g., shame, guilt, empathy, sympathy) also influence their decisions to behave morally or otherwise (Batson, 1991; Damon, 1988; Eisenberg et al., 2001). And although young people may truly want to do the right thing, they may also be concerned about the consequences for themselves in specific situations—for instance, how much personal sacrifice will be involved and how much various actions will gain other people's approval or respect (Batson & Thompson, 2001; Cillessen et al., 2011; Hawley, 2014; Narváez & Rest, 1995; Wentzel et al., 2007).

  Finally, sense of self seems to be an important factor affecting one's inclinations to act morally and prosocially. Young people must believe they're actually capable of helping other people—in other words, they must have high self-efficacy about their ability to "make a difference" (Narváez & Rest, 1995). Furthermore, some adolescents begin to integrate a commitment to moral values into their overall sense of identity: They think of themselves as moral, caring individuals who make other people's rights and well-being a high priority (Blasi, 1995; Hastings et al., 2007; Thorkildsen et al., 2008).

Factors Influencing Moral and Prosocial Development

Piaget conducted some of his research by observing children while they were playing various games. Through these observations, he noticed that children develop a sense of what's good and what's bad, and what's fair and what's unfair (Piaget, 1960). To some degree, advanced moral reasoning depends on *cognitive development.* In particular, it depends on the ability to think simultaneously about multiple issues (e.g., about various people's motives and intentions in a situation) and also on the ability to comprehend such abstract ideals as justice and basic human rights. Indeed, youth who are more adept at social perspective-taking tend to engage in more prosocial behaviors than those who are less adept (Tamnes et al., 2018). Moral development also is related to ongoing brain development through childhood and adolescence (Lahat et al., 2013). However, cognitive development doesn't *guarantee* moral development. It's quite possible to think abstractly about academic subject matter and yet reason in a self-centered, preconventional manner (Kohlberg, 1984; Nucci, 2006, 2009; Turiel, 2002).

Children's social and cultural environments have a significant influence on their moral and prosocial development (e.g., Ball et al., 2017; Chiu Loke et al., 2014). When children feel accepted by their parents, they are more likely to engage in prosocial behaviors (Putnick et al., 2018). Moreover, when children see adults or peers being generous and showing concern for others, they tend to do likewise (Hoffman, 2000; Rushton, 1980; Spinrad & Eisenberg, 2009). And when they watch television shows that emphasize perspective taking and prosocial actions, they're more inclined to exhibit such behaviors themselves (Christakis et al., 2013; Dubow et al., 2007; Singer & Singer, 1994). Prosocial video games and exposure to prosocial messages through various forms of media seem to have a positive impact (Coyne et al., 2018; Greitemeyer, 2011; Prot et al., 2014). Ideally, society's prosocial messages must be consistently conveyed through other people's behaviors. Children do *not* make advancements in moral reasoning and behavior simply by hearing adults advocate certain moral values—say, through a short "character education" program (Higgins, 1995; Park & Peterson, 2009; Turiel, 1998).

Children also tend to make gains in moral and prosocial development when adults use **induction**, asking children to think about the harm and distress that some of their behaviors have caused others (Hoffman, 2000; Ramaswamy & Bergin, 2009; Rothbart, 2011). Induction helps children focus on others' distress and recognize that they themselves have been the cause. Consistent use of induction in disciplining children, especially when accompanied by *mild* punishment for misbehavior—for instance, insisting that children make amends for their wrongdoings—appears to promote compliance with rules and foster the development of empathy, compassion, and altruism (Brody & Shaffer, 1982; Hoffman, 1975; Nucci, 2001; Rushton, 1980).

Yet another factor that appears to promote moral and prosocial advancements is *disequilibrium*—in particular, encountering moral dilemmas and arguments that children can't adequately address with their current moral standards and viewpoints. For instance, classroom discussions of controversial topics and moral issues can promote increased perspective taking and a gradual transition to more advanced reasoning (DeVries & Zan, 1996; Power et al., 1989). As Kohlberg suggested, children *construct* (rather than absorb) their moral beliefs; disequilibrium can spur them to revise their beliefs in ways that allow them to consider increasingly complex moral issues.

Diversity in Moral and Prosocial Development

Some diversity in moral and prosocial development is the result of differences in children's environments, but biology seems to be involved as well. For example, children who have a somewhat fearful, anxious temperament in infancy tend to show more guilt and empathy in the early elementary grades than their less anxious classmates. As children grow older, the degree to which they show effortful control—an ability to inhibit selfish and other unproductive impulses—appears to be a factor in their acquisition of a moral conscience (Eisenberg et al., 2006; Kochanska et al., 1998; Rothbart, 2011). Moreover, certain human genes seem to give rise to the development of brain abnormalities that, in turn, predispose their owners to antisocial behavior (Odintsova et al., 2019; Viding & McCrory, 2012).

Gender Differences Researchers have observed minor gender differences in moral and prosocial development. For instance, on average, girls are more likely than boys to feel guilt and shame—in part because they're more willing to take personal responsibility for their misdeeds. Girls are also more likely to feel empathy for people in distress (Alessandri & Lewis, 1993; Lippa, 2002; Rose, 2002; Zahn-Waxler & Robinson, 1995).

Historically, researchers have disagreed about the extent to which girls and boys *reason* differently about situations involving moral issues. In his work with college students, Kohlberg found that males reasoned at a slightly more advanced level than females (Kohlberg & Kramer, 1969). In response, psychologist Carol Gilligan argued that Kohlberg's stages don't adequately describe female moral development (Gilligan, 1982, 1987; Gilligan & Attanucci, 1988). She suggested that Kohlberg's stages reflect a *justice orientation*—an emphasis on fairness and equal rights—that characterizes males' moral reasoning. In contrast, females are socialized to take a *care orientation* toward moral issues—that is, to focus on interpersonal relationships and take responsibility for others' well-being. To see how these two orientations might play out differently, try the following exercise.

Experiencing Firsthand

The Porcupine Dilemma

Consider the following scenario:

> A group of industrious, prudent moles have spent the summer digging a burrow where they will spend the winter. A lazy, improvident porcupine who has not prepared a winter shelter approaches the moles and pleads to share their burrow. The moles take pity on the porcupine and agree to let him in. Unfortunately, the moles did not anticipate the problem the porcupine's sharp quills would pose in close quarters. Once the porcupine has moved in, the moles are constantly being stabbed. (Meyers, 1987, p. 141, adapted from Gilligan, 1985)

What do you think the moles should do? Why?

Chapter 4 describes many gender differences and their possible origins, including socialization practices.

According to Gilligan, males are apt to view the problem as involving a violation of someone's rights: The moles own the burrow and so can legitimately evict the porcupine. In contrast, females are more likely to show compassion, perhaps suggesting that the moles cover the porcupine with a blanket so that his quills won't annoy anyone (Meyers, 1987).

Gilligan raised a good point: Males and females are often socialized quite differently. Furthermore, by including compassion for other human beings as well as consideration for their rights, Gilligan broadened our conception of what morality *is* (Walker, 1995). But in fact, most research studies *don't* find major gender differences in moral reasoning (Eisenberg et al., 1996; Nunner-Winkler, 1984; Walker, 1991). When gender differences do emerge, they may be due to affective responses (i.e., feelings generated by a particular situation), rather than by differences in moral reasoning (Friesdorf et al., 2015). And as Gilligan herself has acknowledged, males and females alike typically reveal concern for both justice and compassion in their reasoning (Brown et al., 1995; Gilligan & Attanucci, 1988; Turiel, 1998).

Cultural and Ethnic Differences Virtually all cultures worldwide acknowledge the importance of individual rights and fairness (reflecting a *justice* orientation) and of compassion for others (reflecting a *care* orientation). Yet, until recently, researchers have largely overlooked other values that may be key components of morality in certain cultures:

- *Loyalty to one's own group*, with a sense of "all for one, and one for all," possibly accompanied by feelings of animosity toward other groups
- *Respect for and obedience to authority figures*, with willing acceptance of a subordinate position in a social decision-making hierarchy
- *Sacredness of certain beings, objects, or life in general*, with unswerving reverence and devotion to these things
- *Liberty*, with preservation of everyone's individual choices and decision-making capacity taking precedence over any needs of the larger group (Haidt, 2012)

People can't simultaneously be "moral" in all of these ways; for instance, obedience to authority figures conflicts with personal liberties, and loyalty to one's own group can sometimes diminish one's respect for the rights of *other* groups. Accordingly, different cultural groups prioritize these various elements somewhat differently (Haidt, 2012;

Miller, 2007). For example, in much of North America, helping others (or not) is considered to be a voluntary choice—reflecting respect for individual liberties—but in some societies (e.g., in many Asian and Arab countries) it is one's moral *duty* to help people in need. Such a sense of duty, which is often coupled with a strong sense of loyalty to family and the community, can lead to considerable prosocial behavior (Chen et al., 2009; Markus & Kitayama, 1991; Rubin et al., 2010).

Some diversity is also seen in the behaviors that cultural groups view as moral transgressions versus those they see as conventional transgressions (Cameron et al., 2012; Haidt, 2012; Miller et al., 2018; Nucci, 2001, 2009). For example, in mainstream Western culture, how one dresses is largely a matter of convention and personal choice. In some deeply religious groups, however, certain forms of dress (e.g., head coverings) are seen as moral imperatives. As teachers, then, we must remember that our students' notions of morally appropriate and inappropriate behaviors may sometimes be quite different from our own. At the same time, we must *never* accept behaviors that violate such basic principles as equality and respect for other people's rights and well-being.

Keep in mind that students from diverse cultures may have different ideas about behaviors that are morally desirable (and in some cases mandatory) versus behaviors that are morally wrong. If necessary, explain to students in private that some behaviors considered appropriate in their culture are unacceptable in your classroom because they infringe on other people's rights and well-being.

Encouraging Moral and Prosocial Development at School

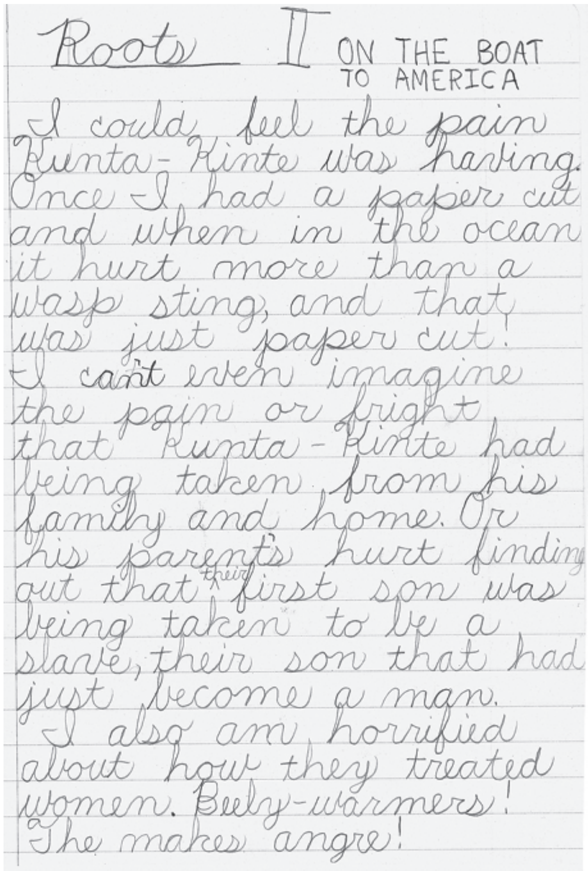
As teachers, we play an important role in helping children and adolescents acquire the beliefs, values, and behaviors critical to their effective participation in a democratic and compassionate society—a society in which everyone's rights are respected and everyone's needs are taken into consideration. And when our students act prosocially and are empathetic to the needs of their peers, our students may experience a greater overall sense of well-being, and may be better able to focus on their own schoolwork and achieve at higher levels (Lewis et al., 2021; Panayiotou et al., 2019). Following are several general suggestions based on research findings.

When a student hurts a peer's feelings, use that as an opportunity to talk about what happened, to help the student understand why the behavior was harmful.

- *Encourage perspective taking, empathy, and prosocial behaviors.* Efforts to promote perspective taking, empathy, and such prosocial skills as sharing and helping others do seem to enhance students' moral and prosocial development (Chernyak & Kushnir, 2013; Nucci, 2009; Spinrad & Eisenberg, 2009). Perspective taking and empathy can and should be encouraged in the study of academic subject matter as well (Brophy et al., 2009; Davison, 2011). For example, Figure 3.6 shows two writing samples created during history lessons about slavery in the pre–Civil War United States. The reaction paper on the left was written by 10-year-old Charmaine, whose fifth-grade class had been watching *Roots*, a miniseries about a young African man (Kunta Kinte) who is captured and brought to America as a slave. Charmaine acknowledges that she can't fully grasp Kunta Kinte's physical pain. Even so, she talks about his "pain" and "fright" and about his parents' "hurt" at losing their firstborn son, and she is incensed by some colonists' view of African women as little more than "beeby [baby] warmers." The diary entries on the right were written by 14-year-old Craig, whose ninth-grade history teacher asked his class to write journal entries that might capture the life of a Southern plantation owner. Notice that Craig tries to imagine someone else (a plantation owner) taking *other people's* perspectives (those of slaves). Such two-tiered perspective taking is similar to recursive thinking but in this case involves thinking "I think that you think that someone else thinks. . . ."

- *Give reasons for why some behaviors are unacceptable.* Although it's important to impose consequences for immoral and antisocial behaviors, punishment by itself often focuses children's attention primarily on their own hurt and distress. To promote moral and prosocial development, we must accompany punishment with induction, focusing students' attention on the hurt and distress their behaviors

Figure 3.6 Two examples of perspective taking related to slavery in the pre–Civil War United States.



Roots II ON THE BOAT TO AMERICA

I could feel the pain Kunta-Kinte was having. Once I had a paper cut and when in the ocean it hurt more than a wasp sting, and that was just paper cut! I can't even imagine the pain or fright that Kunta-Kinte had being taken from his family and home. Or his parents hurt finding out that their first son was being taken to be a slave, their son that had just become a man. I also am horrified about how they treated women. Beely-warmers! The makes angre!

My Diary

July 1, 1700
Dear Diary - Today was a scorcher. I could not stand it and I was not even working. The slaves looked so hot. I even felt for them. and it is affecting my tobacco. It's too hot too early in the season. The tobacco plants are not growing quickly enough. I can only hope that it rains. Also today Robert Smith invited me to a ball at his house in two days. In 5 days I am going to have my masked ball. We mailed out the invitations two days ago. My wife, Beth, and I thought of a great idea of a masked ball. We will hire our own band.

July 2, 1700
Dear Diary - It was another scorcher. I wish it would cool down. I don't think the salves can handle it. It looked like some of them would faint. I had them drink more water. Later in the day a nice breeze came up. Then I gave them the rest of the day off. Also today we planned a trip to Richmond. . . .

July 5, 1700
Dear Diary - Today we had to wake up before the sun had risen. After a breakfast of hot cakes, eggs, and sausage, we headed back home. We got there at the end of the morning. When I got back it was very, very hot. One of the slaves fainted so I gave him the rest of the day off, fearing revolt. I also gave them extra food and water. It makes me think that they are only people too. I know that this is unheard of but it really makes me think.

have caused *others* (Hoffman, 2000; Nucci, 2009; M. Watson, 2008). For example, we might describe how a behavior harms someone else either physically ("Having your hair pulled can really be painful") or emotionally ("You hurt John's feelings when you call him names like that"). We might also show students how they have caused someone else inconvenience ("Because you ruined Marie's jacket, her parents are making her work around the house to earn the money for a new one"). Still another approach is to explain someone else's perspective, intention, or motive ("This science project you've just made fun of may not be as fancy as yours, but I know that Jake spent many hours working on it and is quite proud of what he's done").

Engage students in discussions of moral issues related to academic subject matter. Social and moral dilemmas often arise within the school curriculum. Consider the following questions that might emerge in discussions about academic topics:

- Is military retaliation for acts of terrorism justified if it involves killing innocent people?
- Should laboratory rats be used to study the effects of cancer-producing agents?
- Was Hamlet justified in killing Claudius to avenge the murder of his father?

Such dilemmas don't always have clear-cut right or wrong answers. We can encourage students to discuss such issues in several ways. Some effective strategies might include (a) helping your students to identify all aspects of a dilemma, including the perspectives of the various individuals involved; (b) creating a classroom environment in which students are encouraged to express their beliefs without fear of embarrassment or disapproval; and (c) encouraging students to explore their reasons for thinking as they do... that is, to clarify and reflect on the moral principles on which they are forming their judgments (Reimer et al., 1983).

- *Get students actively involved in community service.* As we've seen, students are more likely to adhere to strong moral principles when they have high self-efficacy for helping others and when they have integrated a commitment to moral ideals into their overall sense of identity. Such self-perceptions don't just appear, of course. Children are more likely to have high self-efficacy for prosocial activities when they have the guidance and support they need to carry out the activities successfully. And they're more likely to integrate moral and prosocial values into their overall sense of self when they become actively involved in service to others, ideally even before they reach puberty (Hastings et al., 2007; Nucci, 2001; Youniss & Yates, 1999). Through ongoing community service activities, elementary and secondary students alike learn that they have the skills and the responsibility for helping people in dire straits and for making the world a better place in which to live. In the process, they also begin to think of themselves as concerned, compassionate, and moral citizens who have an obligation to help those less fortunate than themselves. Sometimes these activities are referred to as **service learning**, particularly when voluntary activities occur in the community and are simultaneously integrated into the academic curriculum (Allen & Antonishak, 2008; Chiva-Bartoli et al., 2020; Kahne & Sporte, 2008; Thorkildsen et al., 2008).

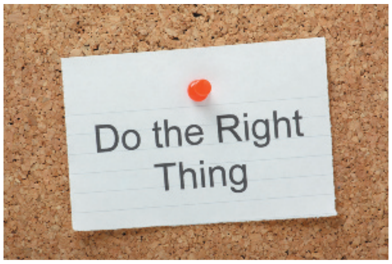
- *One behavior we must explicitly and consistently discourage is cheating* in its various forms, whether it be submitting a research paper downloaded from the internet (i.e., plagiarism), copying other students' responses to quizzes or homework, or giving friends unfair advance notice of test questions. Sadly, students don't always see cheating as being a violation of moral standards (Anderman et al., 2007; Honz et al., 2010). Perhaps they're trying to help a friend, or they perceive an assignment as a waste of time or hopelessly beyond their ability levels. Not only does cheating hinder students' classroom learning—students gain very little from copying other people's work—but it is also dishonest and immoral. Several strategies can potentially discourage cheating:
    - Explain in clear, concrete terms what cheating is—for example, that it includes not only representing another person's work as one's own but also giving certain classmates an unfair advantage over others.
    - Contrast cheating with legitimate collaboration, in which everyone learns something and the submitted work is honestly represented as a joint effort.
    - Independently verify suspected instances of cheating (e.g., by searching the internet for a document that you think a student might have copied word for word).
    - Provide enough guidance and support that students can reasonably accomplish assigned tasks on their own (Anderman, 2015; Anderman et al., 2022; Anderman et al., 2007; Bellanca & Stirling, 2011; Honz et al., 2010; Lenski et al., 2010).

Students will be less likely to cheat when teachers provide them with guidance, support, and enough time to complete their assignments.

To prevent cheating, provide students with support when they get frustrated with their schoolwork and encourage them to ask for help when they need it.

- *Expose students to numerous models of moral and prosocial behavior.* Children and adolescents are more likely to exhibit moral and prosocial behavior when they see other people (including their teachers!) behaving in moral rather than immoral ways. You can also provide simple reminders for your students to try to make prosocial choices in all that they do in school (see Figure 3.7 for an example), and you can provide instruction on how to engage in prosocial behaviors in the classroom (Wiederman et al., 2020). Powerful models of moral behavior can be found in literature as well—for instance, in some age-appropriate children's books and in such classics as Harper Lee's *To Kill a Mockingbird* and Nathaniel Hawthorne's *The Scarlet Letter*. Works of fiction are especially likely to have this beneficial effect when they give readers a good sense of what various characters are thinking and feeling, thus enhancing readers' *theory of mind* (Ellenwood & Ryan, 1991; Kidd & Castano, 2013; Nucci, 2001).

Figure 3.7 An example of a simple reminder that you can post in your classroom to encourage prosocial behavior.



Davi Sales Batista/Shutterstock

Chapter 3 What Have You Learned?

We now return to the learning outcomes listed at the beginning of the chapter and identify key ideas related to each one.

3.1 **Describe the nature and origins of children's temperaments and personality characteristics, and explain how you might adapt your classroom practices to students' diverse personalities.** Children exhibit distinct *personalities*—consistent ways of behaving across a wide range of situations—long before they begin school. To some degree, their personalities reflect their temperaments—their genetic predispositions to be active or subdued, outgoing or shy, adventurous or fearful, and so on. Yet environmental factors affect personality as well: The quality of parent–child emotional bonds (reflecting attachment), the nature of caregivers' parenting styles, and general cultural norms and expectations all play roles in molding children's characteristic ways of behaving.

Students are most likely to thrive and succeed when there is a *goodness of fit* between students' temperaments and personality traits on the one hand, and classroom activities and assignments on the other. For example, temperamentally quiet and self-controlled students may do well with independent paper-and-pencil tasks, more energetic students may be more productive during hands-on activities, and students with poor impulse control may require greater-than-average guidance and supervision.

3.2 **Explain how students' sense of self is apt to influence their behavior and how you can help students develop healthy self-perceptions.** As young people progress through childhood and adolescence, they construct and continually revise their *sense of self*—their perceptions, beliefs, judgments, and feelings about themselves. Children derive their self-views from their own experiences (e.g., their successes and failures) as well as from other people's behaviors and from the achievements of social and ethnic groups to which they belong. As children reach adolescence, their sense of self increasingly incorporates abstract qualities and, eventually, a general sense of identity regarding who they are as people, what they value, and what goals they hope to accomplish. With adolescence, too, come heightened concerns about other people's opinions of oneself (the imaginary audience phenomenon) and an exaggerated belief in one's uniqueness relative to others (the personal fable phenomenon). Perhaps partly as a result of the personal fable—but also as a result of incomplete brain maturation—many adolescents take foolish risks and engage in dangerous activities.

As teachers, we must provide the support students need to be successful and give them feedback that engenders optimism about future accomplishments. Working as either individuals or a team, we can offer activities that channel teenagers' desires for risk and social status into safe, productive behaviors.

3.3 **Apply your knowledge of peer relationships and social cognition as you identify strategies for promoting productive social skills and addressing student aggression.** Productive peer relationships (especially friendships) serve several important functions: They (a) provide a testing ground for emerging social skills, (b) introduce children to new physical and cognitive skills, (c) offer emotional support in times of trouble or uncertainty, and, ideally, (d) promote socially and culturally appropriate behaviors. During adolescence, many students become members of larger social groups (e.g., cliques, subcultures, or gangs) and form romantic relationships. Yet some students are consistently rejected or neglected by their classmates, and these students may especially need teachers' friendship and support.

Most children and adolescents actively try to make sense of their social world. With age, such social cognition becomes increasingly complex and insightful, allowing young people to interact effectively with adults and peers alike. But some students have trouble interpreting social cues correctly and may have few effective social skills. Furthermore, some students engage in either physical or psychological aggression toward certain peers, perhaps as a way of gaining prestige and status within their social group. As teachers, then, we may sometimes need to monitor and guide students' interpersonal interactions; for example, we must explain that psychological bullying (e.g., posting defamatory material on social media) is as harmful and inappropriate as physical aggression. We should also take active steps to promote communication and interaction across individuals and groups with diverse backgrounds and abilities.

3.4 Describe typical advancements in moral and prosocial development over the course of childhood and adolescence, and identify strategies for promoting moral and prosocial development at school. As children move through the grade levels, most acquire an increasingly sophisticated sense of right and wrong. This developmental progression is the result of many things, including increasing capacities for abstract thought and empathy, an evolving appreciation for human rights and other people's welfare, our students' cultural backgrounds, and ongoing encounters with moral dilemmas and situations. Even at the high school level, however, students don't always take the moral high road, as personal needs and self-interests almost invariably enter into their moral decision making. As teachers, we can help students develop more advanced moral reasoning and increasingly prosocial behavior by giving them reasons why certain behaviors are unacceptable, encouraging them to recognize how others feel in various situations, exposing them to models of moral behavior, challenging their thinking with moral dilemmas, and providing opportunities for community service and other prosocial activities.

Practice for Your Licensure Exam

The Scarlet Letter

Ms. Southam's eleventh-grade English class has been reading Nathaniel Hawthorne's *The Scarlet Letter*. Set in 17th-century Boston, the novel focuses largely on two characters who have been carrying on an illicit love affair: Hester Prynne, a young woman who has not seen or heard from her husband for the past two years, and the Reverend Arthur Dimmesdale, a pious and well-respected local preacher. When Hester becomes pregnant, she is imprisoned for adultery and soon bears a child. The class is currently discussing Chapter 3, in which the governor and town leaders, including Dimmesdale, are urging Hester to name the baby's father.

Ms. Southam: The father of the baby . . . How do you know it's Dimmesdale . . . the Reverend Arthur Dimmesdale? . . . What are the clues in the text in Chapter 3? . . . Nicole?

Nicole: He acts very withdrawn. He doesn't even want to be involved with the situation. He wants the other guy to question her, because he doesn't want to look her in the face and ask her to name him.

Ms. Southam: OK. Anything else? . . .

Student: The baby.

Ms. Southam: What about the baby?

Student: She starts to cry, and her eyes follow him.

Ms. Southam: That is one of my absolutely favorite little Hawthornisms.

(Ms. Southam reads a paragraph about Dimmesdale and then asks students to jot down their thoughts about him. She walks around the room, monitoring what students are doing until they appear to have finished writing.)

Ms. Southam: What pictures do you have in your minds of this man . . . if you were directing a film of *The Scarlet Letter*?

Mike: I don't have a person in mind, just characteristics. About five-foot-ten, short, well-groomed hair, well dressed. He looks really nervous and inexperienced. Guilty look on his face. Always nervous, shaking a lot.

Ms. Southam: He's got a guilty look on his face. His lips always trembling, always shaking.

Mike: He's very unsure about himself.

Matt: Sweating really bad. Always going like this. [He shows how Dimmesdale might be wiping his forehead.] He does . . . he has his hanky . . .

Ms. Southam: Actually, we don't see him mopping his brow, but we do see him doing what? What's the action? Do you remember? If you go to the text, he's holding his hand over his heart, as though he's somehow suffering some pain.

Student: Wire-framed glasses . . . I don't know why. He's like . . .

Mike: He's kind of like a nerd-type guy . . . short pants.

Ms. Southam: But at the same time . . . I don't know if it was somebody in this class or somebody in another class . . . He said, "Well, she was sure *worth* it." Worth risking your immortal soul for, you know? . . . Obviously, she's sinned, but so has he, right? And if she was worth it, don't we also have to see him as somehow having been worthy of her risking *her* soul for this?

Student: Maybe he's got a good personality . . .

Ms. Southam: He apparently is, you know, a spell-binding preacher. He really can grab the crowd.

Student: It's his eyes. Yeah, the eyes.

Ms. Southam: Those brown, melancholy eyes. Yeah, those brown, melancholy eyes. Absolutely.

1. **Constructed-response question:**

   In this classroom dialog, Ms. Southam and her students speculate about what the characters in the novel, especially Arthur Dimmesdale, might be thinking and feeling. In other words, they are engaging in social cognition.

   A. Identify two examples of student statements that show social cognition.

   B. For each example you identify, explain what it reveals about the speaker's social cognition.

2. **Multiple-choice question:**

   Ms. Southam does several things that are apt to enhance students' perspective-taking ability. Which one of the following is the best example?

   a. She models enthusiasm for the novel ("That is one of my absolutely favorite little Hawthornisms").

   b. She walks around the room as the students write down their thoughts about Dimmesdale.

   c. She points out that Dimmesdale is "holding his hand over his heart, as though he's somehow suffering some pain."

   d. She agrees with Mike's description of Dimmesdale as having a guilty look on his face.

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 4

Group Differences

+5
5
+3
7
+4
2
+8
2
+9
6
4
+3
6
+4
3
+7
5
+11
Love

Iofoto/Shutterstock

Learning Objectives

4.1 Describe frequently observed between-group differences and within-group variability for various cultural and ethnic groups. In addition, describe the teacher attitudes and strategies that underlie culturally responsive teaching.

4.2 Describe the nature and origins of typical gender differences in school-age children and adolescents, and explain how you might best accommodate such differences in your classroom.

4.3 Identify challenges that students from low-income families often face. Also, identify several strategies through which you can foster their resilience and help them be successful at school.

4.4 Explain how you might recognize students who are at risk for academic failure and dropping out of school, and identify strategies for helping these students stay in school and get on the path to academic and social success.

CASE STUDY

Students Suddenly Not in School

Mr. Morales is a high school social studies teacher in Las Cruces, New Mexico. Although he is aware that some of his students and their parents are undocumented immigrants, for the most part, Mr. Morales does not know who they are. Recently a raid occurred nearby, and several people were arrested for being undocumented immigrants. There were rumors of additional raids coming soon. After the initial raid, there was a 60% increase in absences in the school district where Mr. Morales teaches. Mr. Morales is worried about his students, wondering if perhaps some of their parents were arrested.[1]

- When some of Mr. Morales' students returned to school in a few days, do you think that they were able to easily transition back into their schoolwork and concentrate on their studies?
- If you were a teacher in this school, what would you do in class when your students returned?

This case study is based in a real occurrence, and it is not an unusual situation in some parts of the United States. Recent data suggest that there are over 10 million undocumented immigrants in the United States, at least one million of whom are youth (NASSP, 2022; Pew Research Center 2021). In this chapter, we'll look in depth at **group differences**—differences we're apt to see *on average* among students of diverse cultural and ethnic groups, different genders, and different socioeconomic backgrounds. As we do so, we must keep in mind four very important points. First, *a great deal of individual variability exists within any group*. We'll be examining research regarding how students of different groups behave *on average*, even though many students within each group are not at all like those averages. Second, *a great deal of overlap typically exists between groups*. Consider sex differences in verbal ability as an example. Many research studies have found girls, on average, to have slightly higher verbal ability than boys (e.g., Halpern & LaMay, 2000; Halpern et al., 2007). The difference is often statistically significant—that is, it probably wasn't a one-time-in-a-hundred fluke that happened simply by chance. Yet the average difference between girls and boys in overall verbal ability is quite small, with a great deal of overlap between the sexes.

Remember that despite average group differences, there is considerable variability within any group as well as considerable overlap between any two groups, and differences in the schools where we teach may not reflect national averages.

Third, we also need to be aware that group differences shouldn't always be taken at face value. Some of the differences often reported by the media actually are somewhat more complex when examined more critically. For example, let's consider the achievement gap between racially diverse students and White students in the United States. Whereas overall, White students tend to achieve at higher levels in math and reading than do racially diverse students, there actually is much variation in the achievement gap across U.S. states, with gaps being lower than the national average in some states, and higher in others (Hemphill et al., 2011; Hung et al., 2020; Nation's Report Card, 2015).

Fourth, we need to recognize that whenever we talk about differences between groups of students (e.g., males and females), and differences within groups of students (e.g., variability in writing ability within male students), these categorical distinctions only represent one small part of our students' identities. As teachers, we need to always be aware that each of our students can be described in many ways: in terms of their gender, socioeconomic status, ethnicity, sexual orientation (at least for adolescents), and many other aspects of their lives and social contexts. This consideration of the complexity and diversity of the identities of each of our students is referred to as **intersectionality** (Beck, 2016; Jones & Wijeyesinghe, 2011; Romero, 2018). As teachers, if we find

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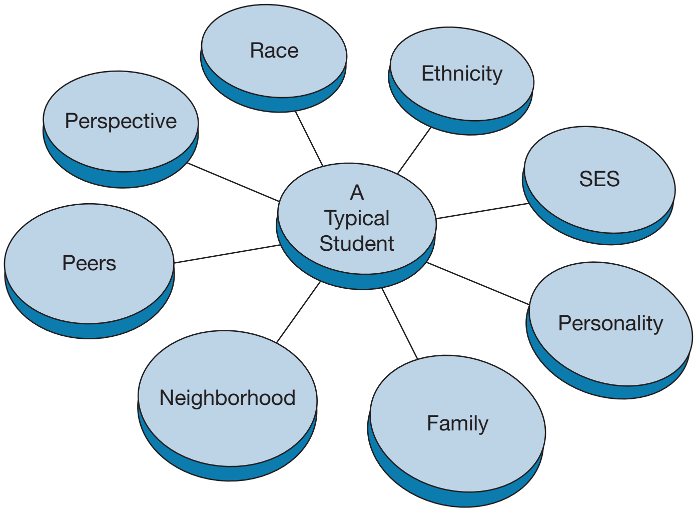
[1] This case was adapted from a story in *The New Yorker* (Blitzer, 2017).

Figure 4.1 Some nonacademic factors that affect student achievement



ourselves engaged in a discussion about the attitudes of a particular group of students, we need to remember that our students' attitudes and abilities are not defined by any one aspect of their identity.

Keep in mind that there are many forms of diversity, not just the ones covered in this chapter. Throughout our careers, we will encounter many types of diversity in our classrooms. We need to be aware of these possibilities, and recognize that the presence of uniquely diverse students provides opportunities for our own learning, and for promoting respect and appreciation of diversity for all students; examples include students whose parents are of the same gender, students who have been adopted either domestically or internationally, students who are HIV or hepatitis positive, or students who have a particularly unique cultural background.

If we are to maximize the learning and development of all our students, we need to be aware of group differences that may influence their classroom performance. When we think about how to support our students' learning, we need to consider many nonacademic factors that can affect our students' learning; Figure 4.1 presents a model of some of these many potential influences. Our challenge is to keep these differences in mind *without* (1) imposing our own culturally based assumptions on what behaviors are "right" and "wrong," (2) assuming that all members of a particular group fit typical group patterns, or (3) forgetting that these differences only represent one aspect of our students' identities. Our erroneous preconceptions about how various students will perform may actually *increase* differences among those students (de Boer et al., 2010; Rubie-Davies et al., 2006; Sirin & Ryce, 2010; van den Bergh et al., 2010).

Chapter 11 describes and explains potential effects of teachers' expectations on students' achievement.

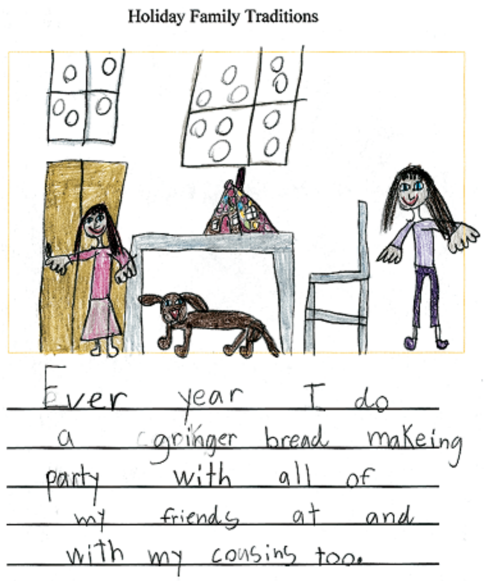
Cultural and Ethnic Differences

Learning Objective 4.1 **Describe frequently observed between-group differences and within-group variability for various cultural and ethnic groups. In addition, describe the teacher attitudes and strategies that underlie culturally responsive teaching.**

The concept of **culture** encompasses the behaviors and belief systems that characterize a long-standing social group. Our cultures affect virtually every aspect of our lives. The culture in which we live influences the perspectives and values we acquire, the skills we find important and master, and the adult roles to which we aspire. It also guides the development of our language and communication skills, our expression and regulation of emotions, and our formation of a sense of self. Sometimes we use the word *culture* to refer to behaviors and beliefs that are widely shared over a large geographic area. For example, *mainstream Western culture* encompasses behaviors, beliefs, and values shared by many people in North America and western Europe. However, any single country encompasses considerable cultural diversity within its borders. Some of this within-country diversity is the result of growing up in particular geographic regions, neighborhoods, religious groups, or socioeconomic circumstances (Cohen, 2009; Payne, 2005; Rasmussen & Lavish, 2014).

In addition, most countries include citizens from a variety of ethnic groups. In general, an **ethnic group** is a group of individuals with a common culture and the following characteristics:

- Its roots either precede the creation of or are external to the country in which it resides. It may be composed of people of the same race, national origin, language, or religious background.
- Its members have a shared history and share a sense of *interdependence*—a sense that their lives are intertwined (NCSS Task Force on Ethnic Studies Curriculum Guidelines, 1992; Berreman, 2001).



Ever year I do
a gringer bread makeing
party with all of
my friends at and
with my cousins too.

Virginia Thompson

Considerable diversity exists within any culture. For example, 7-year-old Emma's family makes gingerbread houses during the holiday season, but many others in her culture do not.

Ethnic groups are often confused with racial groups. Definitions and conceptualizations of race vary greatly (Spencer et al., 2012), and, as teachers, we need to be aware that many students and parents will have differing attitudes toward race. Racial groups generally are based on physical differences between groups of people that are considered as being socially significant. It's important to remember that although race is based on physical differences, the concept of "race" is socially constructed (American Psychological Association, 2021). Thus, a student might belong to the Asian racial group, but may also belong to several ethnic groups (e.g., the student might identify as being Catholic and Thai).

Cultures aren't static entities; instead, they continue to change over time as people incorporate new ideas, innovations, and ways of thinking, and as they interact with other cultures (Kitayama et al., 2007; Rogoff, 2003). Furthermore, there is considerable variation in attitudes and behaviors within a particular culture; individual members may adopt some cultural values and practices but reject others (Goodnow, 2010; Markus & Hamedani, 2007). For example, you might encounter a student who comes from a culture that prohibits eating certain foods and does not afford equal rights to males and females. You may notice, however, that your student accepts cultural norms for diet but rejects the notion of gender inequality.

When people come into contact with a culture very different from their own (e.g., through immigration to a new country), many of them—especially children—gradually undergo **acculturation**, adopting some of the new culture's values and customs. Some acculturation is critical for success in the new cultural environment, but *rapid* acculturation can be detrimental to children's social and emotional well-being. In most instances, children's own cultural groups give them a support network and stable set of values that enable them to do well in school and maintain their self-esteem in the face of discrimination and other challenges (Deyhle, 2008; Matute-Bianchi, 2008; Sam & Berry, 2010).

One way that we can get the best sense of students' cultural backgrounds and ethnic-group memberships is by learning the extent to which they have participated in and continue to participate in various cultural and ethnic-group activities (Gutiérrez & Rogoff, 2003). For example, some Mexican American students live in small, close-knit communities where Spanish is spoken and traditional Mexican practices and beliefs permeate everyday life, whereas others may live in more culturally heterogeneous communities in which Mexican traditions may be cast aside to make time for mainstream American activities. In some instances, students may participate actively in two or more cultures, perhaps because they have emigrated from one country to another, or perhaps because their parents come from distinctly different ethnic or racial backgrounds (Herman, 2004; A. M. Lopez, 2003; Mohan, 2009).

Keep in mind that some students may have multiple cultural affiliations.

Navigating Different Cultures at Home and at School

When they first begin school, many children experience some *culture shock*—confusion about the behaviors expected of them in this new setting. Culture shock is more intense for some students than for others. Most schools in North America and western Europe embrace the norms and values of mainstream Western culture, and so students with this cultural background often adjust quickly to classroom practices. In contrast, students who come from cultural groups with radically different norms and values may experience a **cultural mismatch** between home and school. In particular, they may find school an unsettling place in which they don't know what to expect from others or what behaviors other people expect of *them*. Thus, children from White families may understand that for many teachers, being engaged means sitting quietly and maintaining eye contact with the teacher, whereas children from other cultures may have been socialized to demonstrate their engagement through verbal interaction (e.g., sharing a relevant story) and have been taught that making eye contact with an adult is disrespectful (Kaiser & Rasminsky, 2020). Significant differences between home and school cultures can interfere with students' adjustment to the school setting and ultimately with their academic achievement as well (Phelan et al., 1994; Turner, 2015; Tyler et al., 2008; Ward et al., 2001).

As students gain experience with the culture of their school, they become increasingly aware of their teachers' and peers' expectations for behavior and ways of thinking, and many eventually become adept at switching their cultural vantage point as they move from home to school and back again (Hong et al., 2000; LaFromboise et al., 1993; Matute-Bianchi, 2008). One Mexican American student's recollection provides an example:

> At home with my parents and grandparents the only acceptable language was Spanish; actually that's all they really understood. Everything was really Mexican, but at the same time they wanted me to speak good English. . . . But at school, I felt really different because everyone was American, including me. Then I would go home in the afternoon and be Mexican again. (Padilla, 1994, p. 30)

Not all students make an easy adjustment, however. Some students actively resist adapting to the school culture, perhaps because they view it as conflicting with their own cultural background and identity (Cross et al., 1999; Gay, 2010; Irving & Hudley, 2008; Phelan et al., 1994). Still others try desperately to fit in at school yet find the inconsistencies between home and school difficult to resolve, as illustrated by this report from a teacher whose students included immigrant Muslim children from Pakistan and Afghanistan:

> During the days of preparation for Ramadan Feast, the children fasted with the adults. . . . They had breakfast [before dawn] and then went back to sleep until it was time to get themselves ready for school. In school they refrained from food or drink—even a drop of water—until sunset. By noon, especially on warm days, they were a bit listless. . . . They spoke about their obligation to pray five times daily. In their writing they expressed the conflict within:
>
>> *I always think about my country. I think about going there one day, seeing it and practicing my religion with no problems. . . . Before sunrise, I can pray with my family. But at school we can't say to my teacher, "Please, teacher, I need to pray."* (Igoa, 1995, p. 135)

As teachers, we must learn as much as we can about the ways in which students from various cultural and ethnic groups are apt to be different from one another and from ourselves. Equipped with such knowledge, we can make accommodations to help students from all backgrounds adjust to and thrive in our classrooms.

Cultural Competence

Effective teachers continuously work toward improving their cultural competence. The National Education Association defines *cultural competence* in the following manner:

> Cultural competence is having an awareness of one's own cultural identity and views about difference, and the ability to learn and build on the varying cultural and community norms of students and their families. It is the ability to understand the within-group differences that make each student unique, while celebrating the between-group variations that make our country a tapestry. This understanding informs and expands teaching practices in the culturally competent educator's classroom. (National Education Association, 2018)

Tremendous cultural variation exists within African American, Latina/o/x, Asian American, Native American, European American, and other groups. Thus, we must be careful not to form stereotypes about *any* group. At the same time, knowledge of frequently observed cultural differences, such as those described in the following sections, can sometimes help us better understand why students behave as they do and to become more culturally competent.

Language and Dialect One obvious cultural difference is language. Although most students speak English at school, our students may experience different language environments outside of school. In the United States, 22.6% of children speak a language other than English at home (Forum on Childhood and Family Statistics, 2021). There can also be much variation within individual students' homes regarding how much English or another language is used (Branum-Martin et al., 2014). Whereas the entire family may speak another language almost all of the time in some homes, in other homes, one parent may speak English much of the time. But even if children speak English at home, they may use a form of English different from the **Standard English** typically used at school. More specifically, they may speak in a different **dialect**, a form of a particular language that includes some unique pronunciations, idioms, and grammatical structures. Dialects tend to be associated either with particular geographic regions or with particular ethnic and cultural groups. Sometimes children will speak differently at home than in school—a child might use a dialect at home, but speak Standard English at school; this deliberate shift in language usage is referred to as **code-switching** (O'Neal & Ringler, 2010).

Cultural and ethnic variations among families affect children's development of various language and literacy skills. As educators, we must remember there will usually be much more variation in children's linguistic skills within various ethnic groups than between ethnic groups. Nevertheless, it is helpful to be aware of some of these developmental differences. For example, children who reside in homes in which only Spanish is spoken are not exposed to English as much as are their peers in English-speaking homes; if English is the language used for instruction at school, then those children may initially be at a disadvantage and need support in the form of bilingual education (Lonigan et al., 2013).

Perhaps the most widely studied ethnic dialect is **African American English** (you may also see the terms *Black English*, *African American Vernacular English*, and *Ebonics*). This dialect, which is actually a group of dialects that vary somewhat from place to place, is characterized by certain ways of speaking that are distinctly different from those of Standard English. At one time, some researchers believed that an African American dialect represented a less complex form of speech than Standard English and thus encouraged educators to teach students to speak "properly" as quickly as possible. But researchers now realize that African American dialects are, in fact, very complex languages with predictable sentence structures and that these dialects promote communication and sophisticated thinking processes as readily as Standard English (Alim & Baugh, 2007; Hulit & Howard, 2006; McWhorter, 2017; Spears, 2007).

Many children and adolescents view their native dialect as an integral part of their ethnic identity. Furthermore, when a particular dialect is the language preferred by local community members, it's often the means through which people can most effectively connect with one another in face-to-face interactions and text messaging (Godley & Escher, 2011; Ogbu, 2003; Paris & Kirkland, 2011).

Nevertheless, lack of proficiency in Standard English can impede children's reading and writing development, and in later years, their use of a distinct regional or cultural dialect may lead other people to underestimate or discredit their abilities. For such reasons, many experts recommend that all students in English-speaking countries develop proficiency in Standard English. Children and adolescents function most effectively when they can use both their local dialect and Standard English in appropriate settings. For example, although we may wish to encourage Standard English in much of our students' written work or in some oral presentations, we might find other dialects quite appropriate in creative writing, classroom discussions, or in some class presentations (Adger et al., 2007; DeBose, 2007; Ogbu, 1999, 2003; Smitherman, 1994). In general, being aware of and accommodating students' cultural differences in language use can enhance our ability to educate students from diverse linguistic backgrounds (Bailey et al., 2015).

Encourage students to use both Standard English and their local dialect, each in appropriate settings.

Talkativeness and Verbal Assertiveness Some students are inherently more talkative than others. While there are many reasons why individuals may be more or less talkative, at times students' cultural backgrounds explain how much they talk. Relatively speaking, mainstream Western culture is often thought of as a chatty one, in which people make small talk as a way of maintaining interpersonal relationships (Gay, 2010; Trawick-Smith, 2003). In some African American communities, people often communicate with a great deal of energy and enthusiasm (Gay, 2006; Tyler et al., 2008); in certain other cultures, however, silence is golden (Norenzayan et al., 2007; Trawick-Smith, 2003). For example, many people from Southeast Asian countries believe that effective learning is best accomplished through attentive listening rather than through speaking (Li, 2005; Li & Fischer, 2004; Volet, 1999).

Chapter 11 looks more closely at cultural differences in emotional expressiveness.

Some talkative cultures are also assertive ones, in that people readily voice their opinions, perhaps interrupting those who are speaking; for example, this is the case for many African Americans, European Americans, and Hawaiians. People from quieter cultures tend to be more subtle and tentative in expressing their opinions—for instance, they might begin a sentence by saying "I'm not sure, but perhaps . . ."—and they may not be as likely to reveal their emotions during conversations (Gay, 2010; Morelli & Rothbaum, 2007; Tyler et al., 2008; Ward et al., 2001).

In addition, different cultural and ethnic groups have diverse views about how assertive children should be with adults. In mainstream Western culture, a common expectation is that children will speak up whenever they have comments or questions. However, universal expectations of this nature are problematic, as some children and adolescents may not feel safe in speaking out. Students from diverse ethnic backgrounds can't always assume that their comments will be received well by their classmates. For example, Woodson (2020) notes that Black girls' speech in particular needs to be considered within the contexts of these girls' experiences. There are many situations in which Black girls may not feel comfortable or safe in expressing their authentic opinions or feelings. For example, Black girls often can't simply assume that their responses or opinions will generate the same reactions from classmates as would the opinions of White girls. In many parts of the world, children are expected to learn primarily through close, quiet observation of adults, rather than by asking questions or otherwise interrupting what adults are doing (Correa-Chávez et al., 2005; Gutiérrez & Rogoff, 2003; Kağitçibaşi, 2007). And in some cultures—for instance, in many Mexican American and Southeast Asian communities and in some African American communities—children learn very early that they should engage in conversation with adults only when their participation has been directly solicited (Delgado-Gaitan, 1994; Grant & Gomez, 2001; Ochs, 1982).

As teachers, we need to be sensitive to such differences in talkativeness, particularly when students have recently arrived from another country. A student who has recently moved from a culture where children and adolescents are socialized to be quiet in classrooms may find the linguistic environments in Western classrooms disruptive and disrespectful. Parents of such students may be particularly concerned that their children will be ignored and not receive sufficient attention from teachers (Mizuochi & Dolan, 1994).

Keep in mind that some students have been taught that initiating a conversation with an adult is disrespectful.

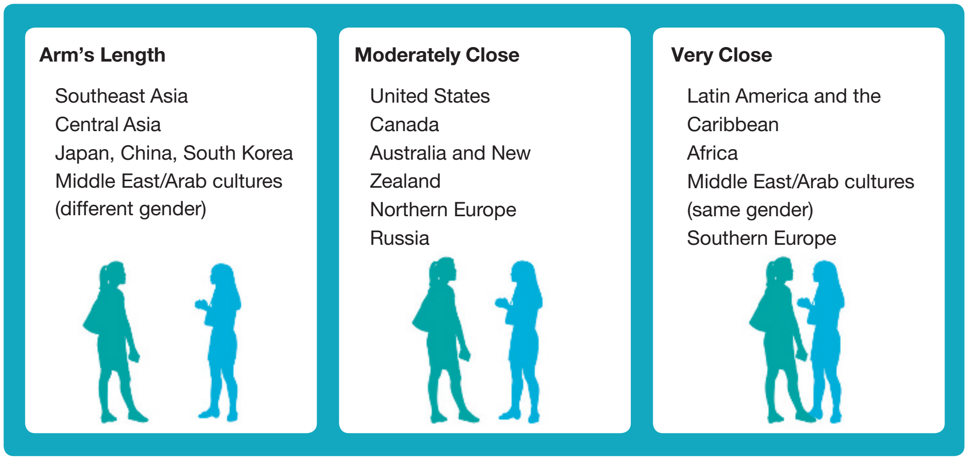
Eye Contact For many of us, looking someone in the eye is a way to show that we're trying to communicate or are listening intently to what the person is saying. But in many Native American, African American, Mexican American, Puerto Rican, and Polynesian communities, a child who looks an adult in the eye is showing disrespect. In these communities children are taught to look down in the presence of adults (Jiang, 2010; McCarthy et al., 2006; Tyler et al., 2008; Uono & Hietanen, 2015).

Don't rely on eye contact as the only indicator that students are paying attention.

Personal Space In some cultures, people stand close together when they talk, and they may touch one another frequently whereas in other cultures, people keep a fair distance from one another, maintaining some **personal space**, especially if they don't know each other very well (Sicorello et al., 2019; Slonim, 1991; Trawick-Smith, 2003; Ward et al., 2001). As teachers, we must be sensitive to the personal space that students from various cultural backgrounds need in order to feel comfortable in interactions with us and with classmates. Although there is great variation within cultures, some broad norms for cultural differences in personal space preferences are presented in Figure 4.2.

Responding to Questions A common interaction pattern in many Western classrooms is the **IRE cycle**: A teacher *initiates* an interaction by asking a question, a student *responds* to the question, and the teacher *evaluates* the response (Cazden, 2001; Mehan, 1979). Similar interactions are often found in parent–child interactions in middle-income European American homes. For instance, when the authors' children were toddlers and preschoolers, we often asked them questions such as "How old are you?" and "What does a cow say?" and praised them when they answered correctly. But children reared in other cultural groups may not necessarily be as familiar with such

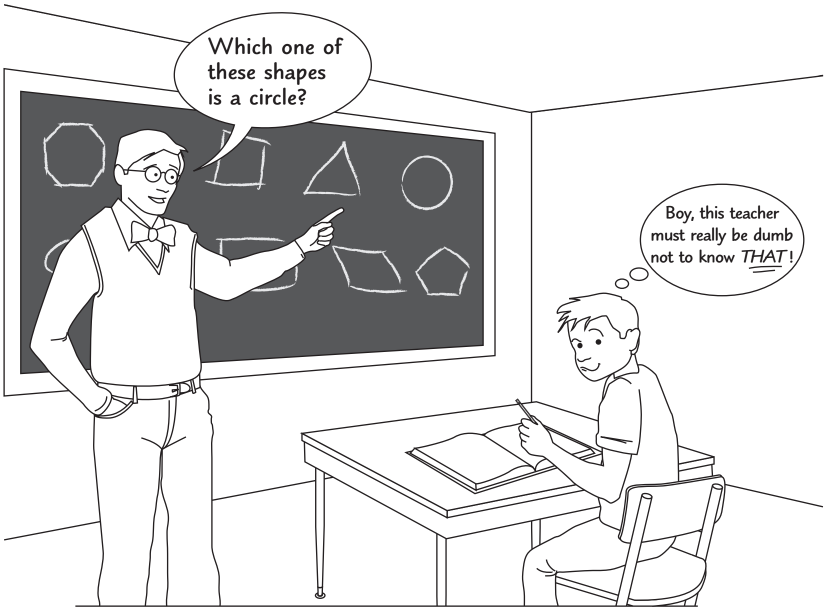
Figure 4.2 Cultural differences in norms for personal space



Arm's Length	Moderately Close	Very Close
Southeast Asia Central Asia Japan, China, South Korea Middle East/Arab cultures (different gender)	United States Canada Australia and New Zealand Northern Europe Russia	Latin America and the Caribbean Africa Middle East/Arab cultures (same gender) Southern Europe

SOURCE: https://www.state.gov/courses/answeringdifficultquestions/assets/m/resources/DifficultQuestions-PersonalSpace.pdf question-and-answer sessions when they first come to school. Furthermore, some children may be quite puzzled when a teacher asks questions to which the teacher already knows the answer (Adger et al., 2007; Crago et al., 1993; Heath, 1989; Rogoff, 2003, 2007). Students in general understand that it is inappropriate either to interrupt someone while they are speaking or to wait long periods of time in between turns during a conversation (Stivers et al., 2009). However, children in some communities are specifically taught *not* to answer questions from strangers about personal and home life—questions such as "What's your name?" and "Where do you live?" (Heath, 1982, 1989).

The issue, then, isn't that children are unaccustomed to questions; rather, it's that they have little experience with certain *kinds* of questions. Moreover, teachers may misinterpret the children's silence, as this teacher does:


Which one of these shapes is a circle?
Boy, this teacher must really be dumb not to know THAT!

Teachers often ask students questions that have answers they already know, but not all children are familiar with this strategy—known as an *IRE cycle*—for assessing students' knowledge.

> The simplest questions are the ones they can't answer in the classroom; yet on the playground, they can explain a rule for a ballgame or describe a particular kind of bait with no problem. Therefore, I know they can't be as dumb as they seem in my class. (Heath, 1983, p. 269)

Be aware that some children are unaccustomed to answering certain kinds of questions.

Cultural differences have also been observed in how long people wait before answering another person's question. People from some cultures use lengthy pauses before responding as a way of indicating respect, as this statement by a Northern Cheyenne individual illustrates:

> Even if I had a quick answer to your question, I would never answer immediately. That would be saying that your question was not worth thinking about. (Gilliland, 1988, p. 27)

Increase wait time as a means of encouraging students from diverse backgrounds to participate in discussions.

When teachers expect immediate answers to their questions—with a delay of, say, a second or less—students from these cultures may not have the time they need to show respect as they respond. Be wary of interpreting such delays as lack of ability or engagement. Such students are more likely to participate in class and answer questions when their teachers provide a more extended **wait time**—that is, when several seconds of silence can elapse after the teacher's question or another student's comment (Castagno & Brayboy, 2008; Tharp, 1989).

Increasing teacher wait time also enhances thinking and learning, as you'll discover in Chapter 7.

Public Versus Private Performance In many classrooms, learning is a very public enterprise. Individual students are often expected to answer questions or demonstrate skills in full view of their classmates, and they're encouraged to ask questions when they don't understand something. Such practices, which many teachers take for granted, may confuse or even alienate some students (García, 1994). If a student does not yet understand all aspects of a lesson, they may be extremely reluctant to respond publicly. For example, many Native American children are accustomed to practicing a skill privately at first, performing in front of a group only after they've attained a reasonable level of mastery (Castagno & Brayboy, 2008; Suina & Smolkin, 1994). And children in some Native American and Hawaiian communities may feel more comfortable responding to questions as a group rather than interacting with adults one on one (Au, 1980; Miller, 1995).

Remember that some students feel more comfortable practicing new skills in private.

Views about Teasing Although people in some cultures think of teasing as mean spirited, it's a common form of social interaction in certain cultures. When taken in the right spirit, teasing serves a variety of functions for particular cultural groups—perhaps providing a source of amusement and an outlet for verbal creativity, exerting gentle pressure to engage in more productive behavior, or helping children learn how to take criticism in stride (Adger et al., 2007; Campos et al., 2007; Cole et al., 2006; Rogoff, 2003). As teachers, we need to pay particular attention to instances when students from different cultural backgrounds tease one another. Whereas it may be acceptable for students from within a specific cultural group to tease each other, boundaries may be crossed when students from outside of that cultural group engage in the teasing.

Cooperation Versus Competition In a traditional Western classroom, students are rewarded when, as individuals, they achieve at high levels. In some cases—for example, when teachers grade on a curve or post "best" papers on a bulletin board—students must actually compete with one another in order to be successful.

Yet in some cultures—including many Native American, Mexican American, African, Southeast Asian, and Pacific Island communities—*group* achievement may be valued over individual success. Students from these cultures may be more accustomed to working cooperatively and for the benefit of the community, rather than for themselves, and value humility about their personal accomplishments (Chen et al., 2009; Mejía-Arauz et al., 2007; Tyler et al., 2008).

Students from cooperative cultures may resist when asked to compete against their classmates, as 16-year-old Maria explains:

> I love sports, but not competitive sports. [My brother is] the same way. I think we learned that from our folks. They both try to set things up so that everyone wins in our family and no one is competing for anything. (Pipher, 1994, p. 280)

Students may also be confused when teachers reprimand them for helping one another on assignments or for sharing answers, and they may feel uncomfortable when their individual achievements are publicly acknowledged. Group work, with an emphasis on cooperation rather than competition, often facilitates the school achievement of these students (Deyhle & Margonis, 1995; Lipka, 1998; Miller, 1995; Rogoff, 2003).

Make frequent use of cooperative activities, especially when students' cultures place high value on cooperation.

Family Relationships and Expectations In some cultures, family bonds and relationships are especially important, and extended family members often live nearby. Students growing up in these cultures are likely to feel responsibility for their family's well-being, to have a strong sense of loyalty to other family members, and to go to great lengths to please their elders. It isn't unusual for students in such communities to miss school when their help is needed at home (Banks & Banks, 1995; Fuligni, 1998; Kağitçibaşi, 2007; McIntyre, 2010).

Relate what you are teaching to students' home environments and cultures. Establish and maintain open lines of communication with parents, and work with them to identify ways in which home and school can collaborate in helping students be successful at school.

In most cultures, school achievement is highly valued and parents encourage their children to do well in school (May & Witherspoon, 2019; Monzó, 2010; Pearce, 2006; Spera, 2005). But some cultural groups place even higher priority on other accomplishments. For example, when preparing young children for school, many Latina/o/x families place particular emphasis on instilling appropriate social behaviors—for instance, showing respect for adults and cooperating with peers (Greenfield et al., 2006; Tyler et al., 2008). And in some cultural groups, an early pregnancy is a cause for joy even if the mother-to-be is young or hasn't yet completed high school (Deyhle & Margonis, 1995; McMichael, 2013).

We must certainly be sensitive to situations in which the achievements that *we* think are important are seemingly not valued by students' families. Whenever possible, we must show our students how the curriculum and classroom activities relate to their cultural environment and their own life goals (Brayboy & Searle, 2007; Lipman, 1995; Moje & Hinchman, 2004). We must also maintain open lines of communication with parents. Because some parents of ethnically diverse children can feel intimidated or unwelcomed by school personnel, teachers often need to take the first step in establishing productive parent–teacher relationships. When teachers and parents realize that both groups want students to succeed, they're more likely to work cooperatively to promote student achievement (Anderman & Anderman, 2021; Edwards & Turner, 2010; Reschly & Christenson, 2009).

Chapter 12 identifies many strategies for working effectively with parents.

Conceptions of Time Many people regulate their lives by the clock: Being on time for appointments, social engagements, and the dinner table is important. This emphasis on punctuality isn't characteristic of all cultures, however. For example, many Latina/o/x and Native American groups don't observe strict schedules and timelines (Tyler et al., 2008; Ward et al., 2001). Not surprisingly, children from these communities may sometimes be late for school and may have trouble understanding the need to complete school tasks within a certain time period.

Similarly, in most Western cultures, we tend to emphasize thinking about future time—what we will do tomorrow, our plans for next summer, or our goals for the next 10 years. Nevertheless, not all cultures emphasize future time; we need to be aware that some of our students may be less focused on the future than are others. For example, results of studies of individuals who speak Arabic indicate that an orientation toward the past is more prominent than an orientation toward the future (de la Fuente et al., 2014). Thus, students from some cultural or linguistic backgrounds may tend to talk about and value the past more than do other students.

To succeed in mainstream Western society, students eventually need to learn punctuality. At the same time, we must recognize that not all students will be especially concerned about clock time when they first enter our classrooms. Certainly, we should expect students to come to class on time and to turn in assignments when they're due. But we must be patient and understanding when, for cultural reasons, students don't develop such habits immediately.

Encourage punctuality but be patient if students' cultural backgrounds have placed little emphasis on clock time.

Worldviews Our general beliefs and assumptions about the world—collectively known as our **worldview**—are often so integral to our everyday thinking that we take them for granted and aren't consciously aware of them (Koltko-Rivera, 2004; Losh, 2003). Some beliefs that permeate the curriculum in traditional Western schools aren't universally shared, however. Consider the following examples:

Consider how students' diverse worldviews might influence their interpretations of classroom subject matter.

- Fourth graders from the Menominee culture (a Native American group) often show exceptionally high achievement scores in science, but by eighth grade, their scores may decline considerably. Menominee culture encourages children to think about the many ways in which they are a *part* of nature, rather than taking care of or dominating it, and children increasingly find the school science curriculum at odds with this view (Atran, Medin, & Ross, 2005; Medin, 2005).
- When American high school students read newspaper articles about the appropriateness or inappropriateness of prayer in public schools, some view the trend away from prayer as a sign of progress toward greater religious freedom. But others—those from deeply religious Christian families, for instance—may view the same trend as a decline that reflects abandonment of the country's religious heritage (Mosborg, 2002).
- During the COVID-19 pandemic, some individuals questioned the scientific reliability of the vaccinations that were developed, whereas others readily accepted them (Sinatra & Hofer, 2021).

As you can see, then, students' worldviews are likely to influence their interpretations of current events and classroom subject matter (Kağitçibaşi, 2007; Keil & Newman, 2008).

Creating a Culturally Inclusive Classroom Environment

Clearly, we must be aware of and responsive to the different ways in which students of various cultural and ethnic groups are likely to think and act. It's equally important that we help our *students* develop such awareness and responsiveness, enabling them to become productive members of both the school community and our increasingly multicultural society. Following are several suggestions.

- *Come to grips with your own cultural lens and biases.* When teachers harbor negative perceptions toward students from diverse cultural backgrounds, their interactions with those students can be affected. For example, when teachers have negative beliefs about ethnically diverse students (e.g., believing that some students may be less interested in their studies than others), they are somewhat more likely to use instructional practices that focus on and exacerbate ability differences among students (Kumar et al., 2015). The assumptions and worldviews we've acquired in our own culture—for instance, the assumption that good parents actively direct and control their children's behaviors—are often so pervasive in our lives that we tend to treat them as common sense, or even as facts, rather than as the beliefs they really are. These beliefs become a *cultural lens* through which we view events—a lens that may lead us to perceive other cultures' practices as somehow irrational and inferior to our own.

  Culturally competent teachers who work effectively with students from diverse backgrounds are keenly aware that their own cultural beliefs are just that—beliefs. And they make a concerted effort *not* to pass judgment on cultural practices and beliefs very different from their own, but rather to try to understand *why* people of other cultural groups think and act as they do. (Banks et al., 2005; Rogoff, 2003). It's also very important to reflect on how we, as teachers, interpret our students' behaviors and attitudes. In a recent study, preservice teachers were asked to rate the emotions of students that they observed in video recordings. These aspiring teachers were more likely to rate Black children as being angry, when that was not the case (Halberstadt et al., 2020). As educators, we need to continuously challenge our beliefs and reflect on our own biases.

  Recognizing our own cultural assumptions and developing an appreciation for others' views takes time and effort; in fact, it can be a lifelong process. Making a conscious effort to interact with individuals from other cultures, reading literature, watching television shows, and attending cultural events from groups other than our own, and occasionally putting ourselves into situations where we are the minority in some way, can all help us reflect on our personal views and biases. Effective teachers immerse themselves in students' daily lives and cultures—talking with students about their outside interests and activities, getting to know students' families, patronizing local businesses, developing a sense of empathy, and so on (Castagno & Brayboy, 2008; Ladson-Billings, 1995a; Moje & Hinchman, 2004; Okonofua et al., 2022). It's particularly helpful to establish connections with your students about potential similarities in your interests (despite differences in your cultural backgrounds); there almost always will be some overlap, and a recognition of similarities in interests can greatly enhance the quality of teacher–student relationships (Gehlbach et al., 2016). We need to be particularly aware of students who are exceedingly underrepresented in our classrooms, as they may be especially vulnerable to feeling disconnected from school (Kogachi & Graham, 2020). We can also benefit from observing other teachers who have been successful at working with culturally diverse students (Whitaker & Valtierra, 2018). Only when we immerse ourselves in a very different cultural environment can we truly begin to understand how we, too, are products of our own cultures and to appreciate the potential benefits of growing up in a very different one (Banks et al., 2005; Rogoff, 2003).

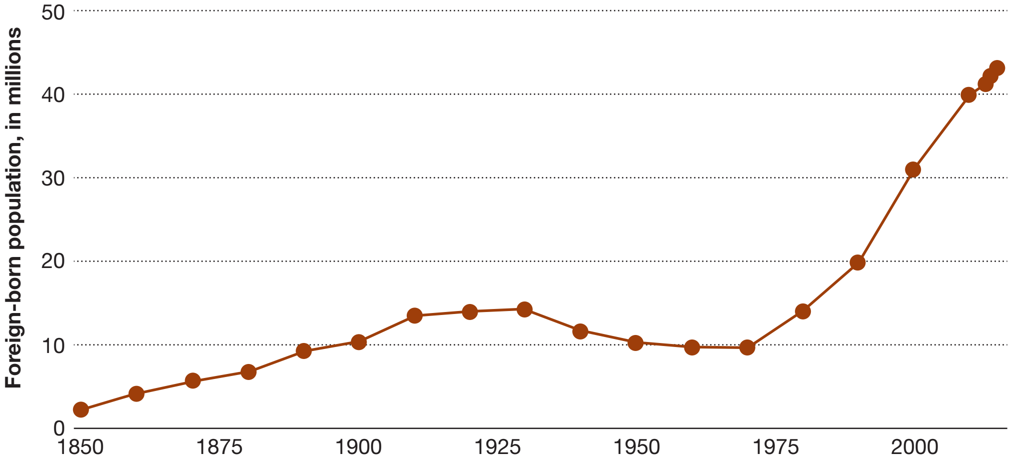
- *Be sensitive to the culture shock that recent immigrants may be experiencing.* In recent years, immigration has become a highly politicized topic in the United States and elsewhere. The data displayed in Figure 4.3 show the particularly sharp increase in immigration to the United States that has occurred over the past 20 years (Pew Research Center, 2020). Whatever our own political views might be on the topic, we must realize that *all* students deserve our guidance and support in their efforts to acquire the knowledge and skills they will need to be successful. Recent immigrant students may lack some of the skills and knowledge that non-immigrant students have acquired, and this can adversely affect their achievement (Martin et al., 2012). Immigrant students also may vary greatly in terms of their readiness for school (Koury & Votruba-Drzal, 2014). Furthermore, media coverage about other parts of the world may make transitions more difficult for some immigrants than others. For example, when tensions are high between Western nations and countries in the Middle East, students who have immigrated from those countries may face particular challenges at school, such as being teased or ostracized by other students (Kumar et al., 2014).

  For recent immigrants, guidance and support from teachers might include not only extra academic assistance, but also explicit instruction in the typical practices and customs—"how things are done"—of their new culture (Vang, 2010; Ward et al., 2001). Also, some students may require accommodations for their religious beliefs; for instance, we might discreetly give devout Muslim students a private place for their early afternoon prayer, and we might excuse them from vigorous physical exercise when they're fasting during Ramadan (Sirin & Ryce, 2010). In particular, immigrant students might need accommodations when taking certain tests; some research suggests that immigrant students especially might benefit from being allowed to take assessments using computer-based platforms, provided that the assessments are administered fairly and equitably to all students (Sonnleitner et al., 2014).

Chapter 14 discusses strategies for assessing student learning.

- *Incorporate the perspectives and traditions of many cultures into the curriculum.* True **multicultural education** isn't limited to cooking ethnic foods, celebrating Cinco de Mayo, or studying famous African Americans during Black History Month. Rather, it integrates the perspectives and experiences of numerous cultural groups throughout the curriculum and gives all students reason for pride in their own

Figure 4.3 Growth in foreign-born population living in the United States.



SOURCE: U.S. Census Bureau population estimates and Pew Research Center tabulations of 2010, 2013–2015 American Community Surveys (IPUMS). Pew Research Center.

cultural heritage. Students from diverse backgrounds are more likely to be motivated to do well in school—and to *actually* do well—when they perceive the school curriculum and classroom activities to be relevant to their own cultures (Brayboy & Searle, 2007; Gay, 2010; Moje & Hinchman, 2004; Rimm-Kaufman & Thomas, 2021; Tyler et al., 2008). By incorporating relevant content, we can help students experience a greater sense of connectedness with school. This sense of connectedness is related to positive long-term outcomes such as a greater likelihood of graduating from high school, particularly in ethnically diverse students (Niehaus et al., 2016). A primary school teacher who often has a majority of non-English-speaking children in her class at the beginning of each school year has described how she incorporates the students' diverse cultural backgrounds into her teaching: "We try to include all cultural celebrations throughout the year—Eid, Diwali, Chinese New Year and so on. The lovely thing about teaching this age is children are still very naive to differences in nationality and religion and so are very accepting to all" (Eustice, 2012, paragraph 24).

It is important to recognize that exposure to novel cultures is beneficial to majority students as well. For example, kindergartners and first graders who share classrooms with children who are nonnative speakers of English (and who are learning to speak English) tend to have lower levels of behavioral problems and better social skills than children with fewer English language learners in their classrooms (Gottfried, 2014).

As teachers, we also need to be aware of cultural misconceptions and misrepresentations that might be prevalent among our students. We can even engage our students in discussions about these biases. As an example, some educators have noticed that the ways that history textbooks present the Battle of the Alamo varies. Researchers engaged primarily White students from the Midwestern United States and Mexican students who lived in Mexico City. The students participated in a project in which they researched the ways that various textbooks discuss the battle. At the conclusion of the project, the students became aware of some of these biases. One student commented that "Through this project I have learned that there is a huge difference between how we were taught and how Mexican students are taught about the Alamo" (Seeberg & Minick, 2012, p. 11), and another stated that "I was not aware how different our schools discuss the Alamo, e.g., in U.S. textbooks Santa Anna is a villain; in Mexican textbooks there is no villain or hero" (Seeberg & Minick, 2012, p. 11).

As teachers, we can incorporate content from diverse cultures into many aspects of the school curriculum. Following are examples:

- In language arts, study the work of authors and poets from a variety of ethnic groups.
- In math and science, draw on students' experiences with their communities building, hunting, farming, and cooking practices.
- In history, look at wars and other major events from diverse perspectives (e.g., the Native American perspective on European settlers' westward migration, the Spanish perspective on the Spanish–American War, the Japanese perspective on World War II).
- In music, explore tonal and rhythmic differences in music from different world regions.
- In both history and current events, consider issues such as discrimination and oppression. (Hughes et al., 2007; Kim, 2011; Lipka et al., 2009; McIntyre, 2010; NCSS Task Force on Ethnic Studies Curriculum Guidelines, 1992; Schultz et al., 2000)

Look for commonalities as well as differences among people from diverse cultural backgrounds.

In our exploration of diverse cultures, we should look for commonalities as well as differences. For example, in the elementary grades we might study how people in various countries celebrate children's birthdays. In the secondary grades, it can be beneficial to explore issues that adolescents of all cultures face: gaining the respect of elders, forming trusting relationships with peers, and finding a meaningful place in society. One important goal of multicultural education should be to communicate that, underneath it all, people are more alike than they are different (Brophy et al., 2009; Ulichny, 1996).

Students should be encouraged to contribute to the multicultural curriculum—for example, by bringing in photographs and favorite foods from home and by expressing their varying experiences and perspectives without fear of ridicule or censure (Gollnick & Chinn, 2009; Jiang, 2010). Ultimately, we should help students realize that diverse cultural groups have much to learn from one another. As an example, students might be surprised to discover that several practices underlying many democratic governments—such as sending delegates to represent particular groups, allowing only one person in a governing council to speak at a time, and keeping government and military bodies separate—were adopted from Native American practices in the 1700s (Rogoff, 2003; Weatherford, 1988).

Stress that people from diverse cultures can all benefit from considering one another's perspectives.

- *Build on students' strengths and adapt instructional methods to their preferred ways of learning and behaving.* Classroom strategies that build on students' existing knowledge, skills, and accustomed ways of learning and behaving are collectively known as **culturally responsive teaching**. For example, if students regularly collaborate with others at home and in the community, we should make frequent use of cooperative group activities (Castagno & Brayboy, 2008; Hurley et al., 2009; Ladson-Billings, 1995a). If, in their informal interactions with peers, students are accustomed to talking simultaneously and elaborating on one another's ideas, we might ask them to answer questions in chorus rather than as individuals (Au, 1980). And if students' home environments are high-energy ones in which several activities often take place simultaneously, we might create a similarly high-energy, multi-activity classroom environment (Tyler et al., 2008).

  When teachers lose sight of the strong influence of culture on students, they often underestimate students' intellectual potential, academic achievement, and language abilities (Hilliard, 1992; Tyler et al., 2006). For example, some African American students may harbor doubts about the economic value of education (Mickelson, 1990). An awareness of the fact that some students feel this way can help teachers to understand why a student might become disengaged from academics.

Chapter 10 discusses how beliefs about the value of education in general, and of specific subject areas, affect students' motivation.

- *Work hard to break down students' stereotypes of particular ethnic groups.* Although we and our students should certainly be aware of real differences among various ethnic groups, it's counterproductive to hold a **stereotype**—a rigid, simplistic, and inevitably inaccurate caricature—of any particular group. Even the most open-minded of us are sometimes prone to holding ethnic stereotypes, as you might discover in the following exercise.

Experiencing Firsthand

Picture This #1

Form a picture in your mind of someone from each of the following three places. Make note of the *first* image that comes to mind in each case:

The Netherlands (Holland)
Mexico
Hawaii

Now answer yes or no to each of these questions:

- Was the person from the Netherlands wearing wooden shoes?
- Was the person from Mexico wearing a sombrero?
- Was the person from Hawaii wearing a hula skirt or flower lei?

If you answered *yes* to any of the three questions, then one or more of your images reflected an ethnic stereotype. Most people in the Netherlands, Mexico, and Hawaii *don't* routinely wear such stereotypical attire.

In the preceding exercise, your stereotypes involved only superficial qualities. Yet people's stereotypes can also include notions about typical personality characteristics and behaviors. Some stereotypes—for instance, perceptions of a certain group as being "stupid," "lazy," or "aggressive"—are derogatory and certainly *not* conducive to productive cross-group interactions.

Consider what James, who is a Black sophomore attending a suburban high school, says when asked how he thinks other people feel about Black people as a whole:

"I do not think they like us that much, because they think we're loud and rude and annoying sometimes. They think we're violent all the time. And that we do not care and they think we're scary" (Smith & Hope, 2020, p. 557). When asked if James agrees with any of his response, he said, "No."

Researchers have identified several possible origins of counterproductive stereotypes. In some instances, family members, friends, or popular media communicate stereotypes through prejudicial remarks, practices, avoiding eye contact, and caricatures (Branch, 1999; Castelli et al., 2008; Nesdale et al., 2005; Theobald & Herley, 2009). In other cases, a history of conflict and animosity between two groups may lead children to conclude that people in the opposing group have undesirable qualities (Pitner et al., 2003). Occasionally, stereotypes appear in curricular materials and classroom instruction—as happens, for instance, when American children role-play the first Thanksgiving by dressing up in paper-bag "animal skins," painting their faces, and wearing feathers on their heads (Bigler & Liben, 2007; Brayboy & Searle, 2007). And sometimes students simply have little or no knowledge about a cultural group very different from their own. For example, when a Muslim girl wears a headscarf to school, a thoughtless classmate might ask, "Are you bald? Is there something wrong with your hair?" (McBrien, 2005b p. 86; Sirin & Ryce, 2010).

At a minimum, unflattering stereotypes lead to misunderstandings among members of diverse cultural groups. When left uncorrected, they can also lead to overtly discriminatory and malicious behaviors—ethnic jokes, racial taunts, social exclusion, and so on (Killen, 2007; Pfeifer et al., 2007). We also need to think about the stereotypes that we, as teachers, may hold and consider how those stereotypes might affect our interactions with our students. For example, although some stereotypes of Black and Latina/o/x youth not valuing their academic work persist, research using nationally representative data from the United States indicates that Black and Latina/o/x students place greater value on their school on average than White students (Seo et al., 2019). Moreover, some teachers provide feedback differentially to ethnically diverse students, giving less criticism and more praise to them than to majority students (Harber et al., 2012). Although this might be well intentioned, we need to be aware that we may be sending different messages to our students when we vary feedback; too much praise for minor accomplishments can communicate that we have low expectations for students. Students who are frequent victims of others' misunderstandings and prejudice are more likely than their peers to become chronically ill, depressed, or to feel that their educational aspirations are being thwarted (Allison, 1998; Brody et al., 2006; Neal-Jackson, 2018; Tatum, 1997). Negative stereotypes about some diverse youth may also be held by others from the same cultural backgrounds. For example, some Black adolescents endorse racial stereotypes suggesting that Whites are more competent in academics, whereas Blacks are more competent in sports and music (Burnett et al., 2020). Negative stereotypes can also turn inward in a phenomenon known as **stereotype threat**: Students become overly anxious in domains in which their group stereotypically does poorly and, as a result, perform more poorly than they otherwise would have (Aronson & Steele, 2005; Walton & Spencer, 2009).

Chapter 11 looks more closely at stereotype threat.

As teachers, we must work hard to correct students' inaccurate and demeaning stereotypes of various cultural and ethnic groups, and we must vigorously address any acts of prejudice and discrimination we witness in the classroom and elsewhere. The Into the Classroom feature "Addressing Students' Stereotypes and Prejudices" offers several concrete strategies. By learning to appreciate multicultural differences within a single classroom, students take an important step toward appreciating the multicultural nature of the world at large.

- *Bring cultural diversity to culturally homogeneous classrooms.* When students attend school only with peers who are culturally very similar to themselves, they may hold especially naive and potentially counterproductive stereotypes about other cultural and ethnic groups (McGlothlin & Killen, 2006; Pfeifer et al., 2007). In such situations, we may have to take students beyond our school boundaries, either physically or vicariously. For instance, we might engage students in community action projects that provide services to particular ethnic groups—perhaps in preschools, nursing homes, or city cultural centers (Sleeter & Grant, 1999). Alternatively, we might initiate a sister school program in which students from two ethnically different communities regularly communicate, exchanging letters or emails, holding virtual conversations (e.g., with software such as Zoom), or sharing photographs, stories, or local news items (Koeppel & Mulrooney, 1992). For example, in one school, elementary school students from the United States and similar aged children from India shared music and dance with each other via a live concert using Zoom (Mallard, 2020). And racially diverse students also benefit from having racially diverse teachers; for example, results of one recent study suggest that Black students who are assigned to at least one Black teacher between kindergarten and the third grade are more likely to graduate from high school and to enroll in college than are other Black students attending the same schools (Gershenson et al., 2018).
- *Think broadly about cultural diversity.* Whereas we often think about cultural diversity in terms of major ethnic and racial identities, we need to remember that many of our students' backgrounds are unique. Some of our students are multiracial (i.e., they identify with more than one racial group). Multiracial students may not identify as multiracial until they are comfortable doing so. Multiracial youth are more likely to become comfortable with their multiracial identities during early adolescence, particularly when they have a diverse group of friends (Echols et al., 2018).
- *Foster democratic ideals and empower students to bring about meaningful change.* Any multicultural education program must include such democratic ideals as human dignity, equality, social justice, and appreciation of diverse viewpoints (Gay, 2010; Gollnick & Chinn, 2009; NCSS Task Force on Ethnic Studies Curriculum Guidelines, 1992). We better prepare students to function effectively in a democratic society when we help them understand that virtually every nation includes numerous cultures and that such diversity provides a richness of ideas and perspectives that will inevitably yield a more creative, productive society overall. Such understanding is reflected in the writing sample in Figure 4.4, from a student who was attending a rural, culturally homogenous high school in New Hampshire. The student's words were genuine; after earning his diploma, he spent two years in a very different cultural environment—a community in rural Brazil—before attending college.

Figure 4.4 In an essay for his American history class, 16-year-old Randy reveals his appreciation of cultural differences.

> To me, diversity is not only a fact of life, but it is life. To be different and unique is what allows people to live a fulfilling life. To learn and admire other people's differences is perhaps one of the keys to life and without that key, there will be too many doors that will be locked, keeping you out and not allowing you to succeed. To learn that a majority of one kind in one place may be a minority of another kind in another place can help to initiate an outlook on life that promotes perspective and reason of any situation.

Teaching respect for diverse perspectives doesn't necessarily mean that we treat all beliefs as equally acceptable.

Into The Classroom

Addressing Students' Stereotypes and Prejudices

- **Use curriculum materials that represent all cultures and ethnic groups as competent, legitimate participants in mainstream society, rather than as exotic curiosities who live in a separate world.**

  A history teacher peruses new textbooks, making sure that the new book that is selected for use portrays members of all ethnic groups in a non-stereotypical manner. The teacher also supplements the book with resources that highlight the historic contributions of members of various ethnic groups.

- **Assign literature depicting peers from diverse cultural backgrounds.**

  As part of a research project in England, several elementary school teachers read to students a series of stories involving close friendships between English children and refugees from other countries. Following this project, the students expressed more positive attitudes toward refugee children than did **control-group** students who had not heard the stories.

- **Explore the nature and complexity of various dialects.**

  A high school language arts class examines some unique features of African American dialects, finding contemporary examples on TikTok and YouTube.

- **Conduct class discussions about prejudice and racism that exist in the school and local community.**

  A middle school in a suburban community creates a number of mixed-race focus groups in which students regularly convene to share their views about interracial relations at the school. Although some students of European American ancestry initially feel uncomfortable talking about this topic with their diverse peers, once the ice has been broken, greater cross-cultural understanding and communication result.

- **Expose students to successful role models from various ethnic backgrounds.**

  A teacher invites several successful professionals from ethnically diverse backgrounds to speak with her class about their careers. When some students seem especially interested in one or more of these careers, she arranges for the students to spend time with the professionals in their workplaces.

- **Assign small-group cooperative projects in which students from diverse backgrounds must combine their unique talents to achieve a common goal.**

  A fourth-grade teacher has small cooperative groups design and conduct schoolwide surveys soliciting other students' opinions on various topics (e.g., ideas for school fundraisers, preferences for cafeteria menu items). The teacher intentionally creates groups that are culturally heterogeneous, knowing that the group members will draw on diverse friendship networks in seeking volunteers to take the surveys. In addition, the teacher makes sure that every member of a group has something unique to offer in survey design or data analysis—perhaps knowledge of word-processing software, artistic talent, or math skills.

- **Emphasize that some people affiliate with two or more cultural groups and that individual members of any single group are often very different from one another in behaviors, beliefs, and values.**

  In a geography unit on major world religions, a middle school teacher regularly points out that members of any single religion often have very different customs. "For example," he says, "some Muslim women dress in much the same way that women in this country do; others also wear head scarves in addition to regular, modern clothes; and still others dress in a *burqa* that covers everything except their hands. Usually, the women wear a scarf or burqa to show modesty about their bodies. Some Jewish women also wear head scarves, but many others don't."

SOURCES: Adger et al., 2007; Barbarin et al., 2010; Boutte & McCormick, 1992; Cameron et al., 2006 (refugee stories example); Dovidio & Gaertner, 1999; Gutiérrez & Rogoff, 2003; Hulit & Howard, 2006, pp. 345–346 (dialect example); Mohan, 2009; Oskamp, 2000; Pfeifer et al., 2007; Schultz et al., 2000 (focus groups example); Tatum, 1997.

For instance, we should certainly not embrace a culture that blatantly violates basic human rights. Respect does mean, however, that we and our students should try to understand other cultural groups' behaviors within the context of their overall beliefs and assumptions.

Ideally, a democracy also provides a context in which students can bring about meaningful change. Students should be encouraged to challenge the status quo and strive for social justice—perhaps regarding such issues as substandard housing, poor voter turnout in certain neighborhoods, school safety, or misuse of natural resources (Ladson-Billings, 1995; Lipman, 1995). For example, after the school shootings in Parkland, Florida student activism to create safer schools gained national attention and brought about changes in state law. Student activism and involvement in community issues seem to instill a "can-do" spirit and optimism that all citizens can have a significant impact on the quality of their own and other people's lives (Eccles, 2007; Kahne & Sporte, 2008; Tate, 1995).

Gender Differences

Learning Objective 4.2 Describe the nature and origins of typical gender differences in school-age children and adolescents, and explain how you might best accommodate such differences in your classroom.

In their academic abilities, boys and girls are probably more similar than you think. But in other respects, they may be more different than you realize. In this section, we discuss similarities and differences associated with gender. Before we begin our discussion, however, we need to take a closer look at some important issues related to terminology and to distinctions between gender and sex.

Gender, Sex, and Gender-Nonconformity

First, we need to recognize the difference between gender and sex. "Sex" is generally used to refer to the biological differences evident at birth that distinguish males and females. In contrast, the term "gender" is much broader, and has more to do with students' identities than with their biological sex. Some of our students, particularly adolescents, may be exploring their developing gender identities. **Gender-fluidity** refers to flexibility in gender identity (Katz & Luckinbill, 2017). Some of our students may identify more as a male on one day, and as a female on another day. When individuals do not conform to the traditional societal descriptions of being either female or male, they may be referred to as **gender-nonconforming**. These students may be particularly at risk of being viewed less positively than their peers (Kwan et al., 2020). A summary of different terms for gender identities that your students might identify with are summarized in Table 4.1.

In recent years, some schools and other public spaces (e.g., stores, movie theaters, malls) have begun to provide gender-neutral bathrooms, which can be used by anyone. And some children's toys are being marketed in ways that are not as

Table 4.1 Terms and Phrases Used to Describe Gender, Sex, and Gender Identities

Bisexual	A person who is attracted to more than one gender or sex (sometimes the term "pansexual" is used as well)
Cisgender	A person whose gender identity is the same as the sex assigned at birth.
Gender-Fluid	A person with a wider gender identity than "male" and "female."
Gender nonconforming	A person who doesn't behave in ways that one might expect based on cultural and/or traditional gender roles and expectations.
Lesbian	A woman who is attracted to other women.
LGBTQ+	An acronym that stands for: Lesbian, Gay, Bisexual, Transgender, and Queer (the plus sign acknowledges that these are not the only sexual/gender identities that someone might have).
Nonbinary	A person who doesn't identify exclusively as male or female; anyone who can't be adequately described as being solely either male or female.
Queer	A broad term referring to a wide range of identities.
Sex	The description of a child at birth, based on their external anatomy.
Transgender	A broad term describing people who identify with gender in ways that differ from their biological sex.
Transitioning	A variety of processes that some transgender individuals choose in order to experience their lives more fully as their true gender.

Adapted from: ETR Associates, 2019; The Human Rights Campaign, 2021, https://www.hrc.org/resources/glossary-of-terms; Jones et al., 2017; The Trevor Project, 2021.

gender-stereotyped as in the past; for example, "Mr. Potato Head" is now being sold as "Potato Head" (Hasbro, 2021). School personnel have become more sensitized to the idea that some students may not choose to use traditional pronouns (e.g., "he" or "him" for a male, "she" or "her" for a female) in describing themselves, preferring to use "they" or "their." You may want to ask each of your students, particularly adolescents, what pronouns they prefer to use.

Research Findings Regarding Gender Differences

Researchers have identified a number of gender differences in the physical, cognitive, personal, and social domains. Keep in mind that in most of these studies, the gender differences were based upon students self-identifying as either female or male and refer to group averages that may not apply to any given individual.

Physical Activity and Motor Skills On average, boys are predisposed to be more active than girls; thus, they often have more trouble sitting still for long periods and may be less likely to enjoy sedentary activities such as reading (Eaton & Enns, 1986; Newkirk, 2002). Before puberty, boys and girls seem to have similar *potential* for physical and psychomotor growth, although girls have a slight edge in fine motor skills (e.g., handwriting). But overall, boys develop their physical and motor skills more, perhaps through participation in organized sports (Eccles, 2005; Thomas & French, 1985). After puberty, boys have a biological advantage in height and muscular strength: They're taller and, because of increased levels of the male sex hormone testosterone, they're stronger (Halpern, 2006; Hyde, 2005; Thomas & French, 1985).

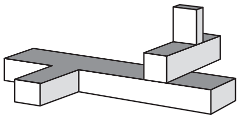
Such differences are hardly justification for favoring either gender when enhancing students' physical fitness, of course. Physical education curricula and sports programs should provide equal opportunities and encouragement for boys and girls to maximize their motor skills and physical well-being.

Cognitive and Academic Abilities Boys and girls perform similarly on tests of general intelligence, on average, in part because experts who construct the tests strive to eliminate items that favor one group or the other (Halpern & LaMay, 2000). Researchers sometimes do find differences in more specific cognitive abilities, however. The most consistently observed gender difference is in **visual–spatial ability**, the ability to imagine and mentally manipulate two- and three-dimensional figures. As an example of what this ability involves, try the next exercise.

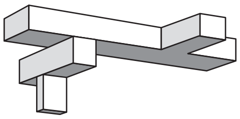
Experiencing Firsthand

Mental Rotation

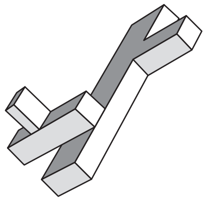
Are the three drawings shown here different rotations of the *same* object, or do they represent two or more *different* objects?



Object A



Object B



Object C

To correctly answer this question, you must "rotate" the objects in your head. If you mentally rotate Object B 180 degrees, you can see that it represents the same three-dimensional configuration as Object A. But if you rotate the right side of Object C down a bit and toward you, you can see that it's *not* the same as Object A; instead, it's a mirror image. Thus, Objects A and B are the same; object C is different. On average, males show greater proficiency in such visual–spatial thinking, even in infancy (Gallagher & Kaufman, 2005; Quinn & Liben, 2008; Siedlecki et al., 2019). In contrast, females have the advantage in certain verbal skills; for instance, girls have, on average, larger vocabularies and can more quickly think of the words they need to express their thoughts (Halpern, 2004, 2006; Halpern & LaMay, 2000; Lippa, 2002).

Importantly, most gender differences in specific cognitive abilities tend to be *quite small*, with considerable overlap between the two groups (Hattie, 2012). In addition, boys sometimes show greater *variability* in cognitive abilities than girls do, causing more boys than girls to demonstrate extremely high or low ability levels relative to their age group (Halpern et al., 2007; Halpern & LaMay, 2000; Valla & Ceci, 2011). Instruction may equalize some of these relatively small differences; for example, when female students receive instruction on how to select appropriate strategies to solve various spatial problems, the relations of visual–spatial gender differences to achievement are lessened (Stieff et al., 2014).

Even though ability levels may be similar, girls consistently earn higher grades in school (Halpern et al., 2007; Halpern & LaMay, 2000; Voyer & Voyer, 2014). If achievement is measured by achievement tests rather than grades, research findings are inconsistent. When differences are found, girls typically have an advantage in reading and writing, and after puberty boys tend to have the upper hand in complex mathematical problem solving (Halpern, 2006; Halpern & LaMay, 2000; Kim et al., 2015; Lindberg et al., 2010; Reilly et al., 2015; Robinson & Lubienski, 2011; Spinath, 2014; Valla & Ceci, 2011). Not only are gender differences in visual–spatial, verbal, and mathematical performance quite small, but some researchers have found they are getting *smaller* in recent years. In other words, boys and girls are becoming increasingly similar in their academic performance (Hutchison et al., 2019; Hyde et al., 2008; Leaper & Friedman, 2007; Spelke, 2005). Moreover, girls are much more likely than boys to show differences in their math and reading performance; this discrepancy, which undoubtedly results from the way females and males are socialized to think about these subject areas, contributes greatly to gender differences in students' intentions to study math or enter math-related careers (Breda & Napp, 2019). Overall, we should expect boys and girls to have similar academic aptitudes for different subject areas.

Nevertheless, research suggests that some gender differences in mathematics are attributable to the fact that female students are more likely to worry and experience anxiety than are males; these feelings can interfere with their ability to focus on and think effectively about complex mathematics problems (Ganley & Vasilyeva, 2014). Results of one study indicate that when female students take a math test immediately before taking a verbal test, they tend to perform worse than do males on the math test; however, when the students take the verbal test first, the females perform as well as or better than males on the math test (Smeding et al., 2013). This is most likely because the females experienced stereotype threat when the math test was presented first, and this affected their performance. Therefore, we should be aware that gender differences can result from many causes, including some seemingly insignificant instructional decisions.

Expect boys and girls to have similar aptitudes for all academic subject areas.

Experience with Technology As societies worldwide are continuing to use computers and wireless technologies in innovative ways, boys and girls alike often are extremely proficient with technology and social media (Greenhow et al., 2009; Valkenburg & Peter, 2009). Overall, boys seem to spend more of their leisure time with technology than girls do. Boys are more likely to have positive attitudes about technology, and they're more likely to play video games, a pastime that may interfere with their reading and writing development but enhances their visual–spatial ability and probably also their comfort and expertise with computers (Cai et al., 2017; Feng et al., 2007; Ivory, 2006; Lucas & Sherry, 2004; Weis & Cerankosky, 2010).

We will discuss motivation in much greater detail in Chapters 10 and 11.

Help girls understand that taking academic risks and making mistakes reflect their willingness to take on challenges and stretch their abilities in new directions.

Motivation in Academic Activities On average, girls are more engaged in classroom activities, more diligent in completing school assignments, and more likely to graduate from high school (Marks, 2000; Marsh et al., 2008; McCall, 1994; Robinson & Lubienski, 2011). Furthermore, girls often are more interested in getting a college education than are boys, and in many countries more females than males earn college degrees (Halpern et al., 2007; National Science Foundation, 2007). However, this eagerness to achieve academically often leads girls to prefer tasks at which they know they can succeed, and some find academic failure devastating. On average, boys are more willing to take on academic challenges and risks and more likely to take their failures in stride (Dweck, 2000; Yu et al., 1995).

Sense of Self Beginning in the upper elementary or middle school grades, boys appear to have a slightly more positive sense of self than do girls. This gender difference seems to be partly due to boys' tendency to *over*estimate their abilities and possibly also to girls' tendency to *under*estimate theirs (Hyde, 2007; Lundeberg & Mohan, 2009; Pajares, 2005). Boys' and girls' self-perceptions also tend to be consistent with stereotypes about what males and females are good at. Although these differences in self-perceptions are particularly evident during adolescence, they often start during the early elementary school years (Bian et al., 2017; Master et al., 2021). Boys tend to rate themselves more highly in mathematics and sports, whereas girls tend to rate themselves more highly in reading and social studies. Such differences in self-perceptions persist even when boys' and girls' actual ability levels are *equal* (Cole et al., 1999; Herbert & Stipek, 2005; Jiang et al., 2020; Leaper & Friedman, 2007; Wigfield et al., 2006).

Interpersonal Behaviors and Relationships One of the most consistently observed gender differences involves aggression. In early childhood and throughout the elementary and secondary school years, boys are more physically aggressive than girls, with the difference being especially large for *unprovoked* aggression (Card et al., 2008; Hyde, 2007; Pellegrini, 2011 Tremblay & Côté, 2019). However, girls can be equally aggressive in a nonphysical way—for instance, by spreading rumors or snubbing peers (Crick et al., 2002; French et al., 2002; Pellegrini & Archer, 2005). Some of their victims can be emotionally devastated by such treatment (Rudolph et al., 2005). Girls also may be more likely than boys to engage in cyberbullying (Connell et al., 2014).

Consistent differences are also seen in boys' and girls' interpersonal activities and relationships. Boys tend to congregate in large groups that engage in rough-and-tumble play, organized group games, and physical risk-taking activities (Maccoby, 2002; Pellegrini et al., 2002; Rose & Smith, 2009). Generally, they enjoy competition and can be fairly assertive in their efforts to achieve their goals (Benenson et al., 2002; Eisenberg et al., 1996; Maccoby, 2002). They may often try to hide their true emotions in social situations, putting up a tough, "nothing-can-bother-me" front (Lippa, 2002; Pollack, 2006).

Communicate that showing emotion is a natural human trait that is appropriate for males as well as females.

Chapter 3 examines peer relationships in greater detail.

Accommodate girls' affiliative nature by providing numerous opportunities for cooperative group work.

Whereas boys are apt to be competitive, girls are more likely to be affiliative and cooperative. Thus, they tend to form closer relationships with their teachers and to achieve at higher levels when classroom activities involve cooperation rather than competition (Inglehart et al., 1994; Wentzel et al., 2010). When working with instructional software, girls may prefer to form relationships with their virtual "teachers," and those relationships, even though they are with a computer-generated character, may help to improve attitudes and motivation in subjects such as mathematics (Kim & Lim, 2013). Girls also seem to be more attuned to others' mental states and more sensitive to the subtle, nonverbal messages—the body language—that others communicate (Bosacki, 2000; Deaux, 1984). Girls spend much of their leisure time with one or two close friends, with whom they may share their innermost thoughts and feelings (Leaper & Friedman, 2007; Rose & Smith, 2009). Although girls can be assertive in making their wishes known, they also tend to be concerned about resolving conflicts and maintaining group harmony, and so they may sometimes subordinate their own needs to those of others (Benenson et al., 2002; Leaper & Friedman, 2007; Rudolph et al., 2005).

Classroom Behaviors In part because boys tend to be physically more active than girls, they're more likely to misbehave in class (Altermatt et al., 1998; Gay, 2006; Sadker & Sadker, 1994). Boys talk more and ask more questions, sometimes without waiting to be called on. They also tend to dominate small-group discussions and work sessions. Often, girls are less likely to publicly volunteer ideas and ask questions, perhaps for fear of looking stupid or perhaps because they worry that looking too smart will reduce their popularity (Jovanovic & King, 1998; Sadker & Sadker, 1994; Théberge, 1994; Wentzel, 2009). Girls are more likely to express their opinions in small-group rather than large-group discussions, and they're more likely to assume the role of leader (thereby developing valuable leadership skills) in same-sex groups (Fennema, 1987; MacLean et al., 1995; Théberge, 1994).

Occasionally have students work in same-sex pairs or groups.

Career Aspirations Historically, boys have had more ambitious career aspirations than girls have. In recent years, however, many girls—especially those in Western countries—have also begun to set their sights on challenging professions. Although boys used to be more likely to aspire to careers in STEM (science, technology, engineering, and math) fields than girls, the gender gap has declined greatly in the health sciences; nevertheless, males still outnumber females in math, physics, engineering, and computer careers (Eccles & Wang, 2016; Martinez & Christnacht, 2021). Often, boys and girls alike focus on careers that are stereotypically "appropriate" for their gender, in part because they have greater self-confidence about their ability to succeed in such careers (Bandura et al., 2001; Jiang et al., 2020; Leaper & Friedman, 2007; Weisgram et al., 2010). Students' general life goals come into the picture as well: Girls are more likely than boys to consider how their career choices might mesh with their desires to work with people (rather than objects) and to raise a family (Diekman et al., 2010; Eccles, 2009).

Some gender differences are especially prevalent for particular age groups. Table 4.2 identifies differences you're apt to see at various grade levels and offers relevant classroom strategies for accommodating these differences.

Origins of Gender Differences

Obviously, heredity determines basic physical differences between males and females; some are present at birth, some emerge at puberty. Because of inherited differences in sex-related hormones—especially estrogen for girls and testosterone for boys—girls reach puberty earlier and boys eventually become taller and stronger. Hormones may account for certain nonphysical differences as well. The gender difference in physical aggression appears to be related to testosterone levels (Lippa, 2002; Moore & Rosenthal, 2006). Hormones may also play a role in the small differences observed in visual–spatial and verbal abilities, possibly by affecting neurological development in different areas of the brain (Valla & Ceci, 2011; Vuoksimaa et al., 2010). Hormones even seem to influence children's preferences for male-stereotypical versus female-stereotypical behaviors (Auyeung et al., 2009; Hines et al., 2002).

Yet environmental factors clearly play a role as well, often by interacting with and amplifying existing biology-based gender differences (Lippa, 2002; Nuttall et al., 2005). Virtually every culture teaches children that some behaviors are more appropriate for males and others more appropriate for females, as the exercise on Pg. 133 may show you.

If you're like most people, your nurse, teacher, and fashion model were females, and your bank president, scientist, and building contractor were males. Gender stereotypes persist throughout our society, and even preschool children are aware of them (Bornholt et al., 1994; Eisenberg et al., 1996; Nosek & Smyth, 2011).

DEVELOPMENTAL TRENDS

Table 4.2 Gender-Related Characteristics at Different Grade Levels

Grade Level	Age-Typical Characteristics	Example	Suggested Strategies
K–2	• Physical abilities, general intelligence, and more specific cognitive abilities roughly equivalent • More self-control in girls than in boys, leading to girls' easier adjustment to a classroom environment • Rigid stereotypes about and conformity with gender-appropriate behaviors • Play groups largely segregated by gender, with different themes in fantasy play (e.g., boys depict heroism, girls depict romance); play activities more active and forceful for boys than girls • Girls may enter formal schooling with stronger pre-literacy skills than boys	Most of the girls in a first-grade class sit still during small-group reading instruction, but some of the boys become fidgety and distracted. The boys are more likely to be attentive in their reading groups if they can physically act out a story they're reading.	Expect and encourage equal achievement in all areas. Give students whatever structure they may need to stay on task to acquire basic skills, but also give them opportunities to release pent-up energy. Provide materials for a wide range of play activities (e.g., household items, building blocks, balls). Monitor play activities for potentially dangerous behaviors; provide guidance about which actions are and are not safe.
3–5	• Boys tend to rate themselves more highly than girls at math, despite equal math achievement • Play groups largely segregated by gender; organized large-group games more common for boys • More competition, aggression, and risk taking in boys than in girls • Onset of puberty earlier for girls (average age 10) • Tendency for some early-maturing girls to feel out of sync with peers, putting them at greater risk for depression	During recess, many of the boys in a fourth-grade class organize a game of baseball or soccer. A few girls join in, but most of the girls stand on the sidelines and talk with one or two friends.	Assure students that boys and girls have equal potential in all areas of the academic curriculum. Set and enforce reasonable limits on play behaviors so that students' physical safety is ensured. Be especially sensitive and supportive as girls show signs of puberty (e.g., allow trips to the restroom as needed).
6–8	• Onset of puberty later for boys (average age 11½) • Greater physical ability and more participation in sports for boys than for girls • Emergence of gender differences in self-esteem and assessments of physical attractiveness and athletic competence, with self-ratings higher for boys and preoccupation with physical appearance greater for girls • Increasing flexibility about which behaviors are gender-appropriate, especially for girls • Tendency for boys' social groups to be larger and less intimate than girls' • More emotional distress for girls when interpersonal relationships go badly; tendency for boys to try to hide feelings of sadness and distress	A student named Jason explains how he often hides his feelings at school: "If something happens to you, you have to say, 'Yeah, no big deal,' even when you're really hurting . . . I've punched so many lockers in my life, it's not even funny. When I get home, I'll cry about it."	Respect students' modesty and need for privacy when they must change clothes or take a shower in physical education or after-school sports. Encourage students to gain skills in domains not stereotypically associated with their gender (e.g., teach cooking and woodworking to boys and girls alike). Encourage both boys and girls to pursue extracurricular sports activities. Communicate to boys that showing emotion and vulnerability is both manly and healthy.
9–12	• Gradual improvement in girls' self-assessments of physical attractiveness • Greater interest in college among girls than among boys • Greater interest in technology-focused classes among boys • Boys more likely to avoid academic work than girls. • Tendency for boys to aspire more to hands-on professions (e.g., working with tools and machines) and for girls to aspire more to social or artistic occupations (e.g., teaching, counseling) • Prosocial behavior seen more in girls than in boys, despite equal ability to act prosocially • Substance abuse and casual sexual intercourse more common in boys than in girls • Depression and eating disorders more common in girls than in boys	Most members of a high school service club are girls. The club plans two community service projects for the year: making monthly after-school trips to a local nursing home and conducting a schoolwide fundraiser to buy holiday gifts for low-income children.	Encourage students to cross stereotypical boundaries in course selection (e.g., girls taking advanced math, boys taking creative writing). Provide information about the benefits of a college education (e.g., invite college graduates from similar cultural groups to those of the student population to come and share their college experiences). Expose students to diverse occupations and professions through guest lectures either in person or remotely, and trips to community businesses and agencies. Avoid having posters or pictures in the classroom that depict gender stereotypes. Work with colleagues and parents to vigorously address unhealthful and risky out-of-school behaviors. Alert the school counselor when you suspect substance abuse, serious depression, suicidal thoughts, an eating disorder, or some other potentially life-threatening condition.

SOURCES: Anderman, 2012; Benenson & Christakos, 2003; Bussey & Bandura, 1992; Card et al., 2008; Crouter et al., 2007; Davenport et al., 1998; Davila, 2008; Eisenberg et al., 1996; Evans-Winters & Ivie, 2009; Fabes et al., 2003; Ford, 1996; Grusec & Hastings, 2007; Halpern, 2004, 2006; Halpern et al., 2007; Hankin et al., 2007; Hardy, 2002; Harter, 1999; Hayward, 2003; Herbert & Stipek, 2005; Hyde, 2005; Hyde & Durik, 2005; Leaper & Friedman, 2007; Liben & Bigler, 2002; Lippa, 2002; Maccoby, 2002; Master et al., 2016, 2021; Matthews et al., 2009; McDevitt & Ormrod, 2013; McTigue et al., 2021; Moore & Rosenthal, 2006; Passolunghi et al., 2014; Pollack, 2006, p. 72 (Jason example); Ponitz et al., 2009; Rhodes & Gelman, 2008; Rogoff, 2003; Rose & Smith, 2009; Rudolph et al., 2005; Ryan & Kuczkowski, 1994; Sadker & Sadker, 1994; Seiffge-Krenke et al., 2009; Skoog & Stattin 2014; Thomas & French, 1985; Wigfield et al., 2006; Zambo & Brozo, 2009 (reading group example).

Experiencing Firsthand

Picture This #2

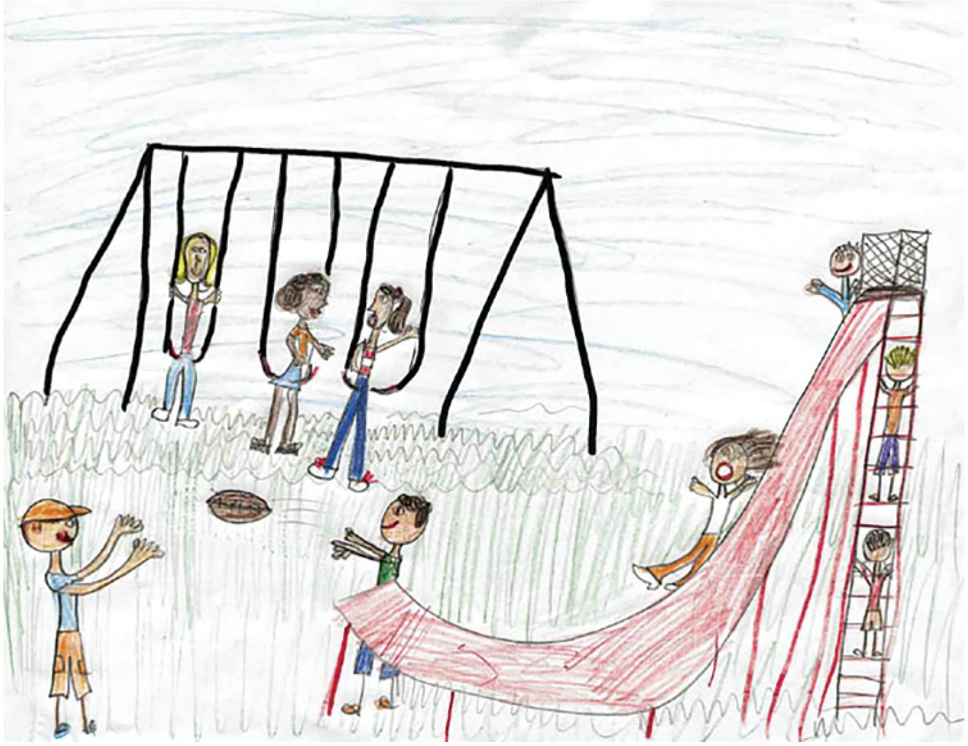
Form a picture in your mind of each of the following individuals. Make note of the *first* image that comes to mind in each case:

Nurse	Scientist
Bank president	Fashion model
Elementary school teacher	Building contractor

Which individuals did you picture as male, and which did you picture as female?

Numerous aspects of society conspire to socialize growing children to conform to gender stereotypes. For example, many adults believe—and communicate the message—that boys are "naturally" better in some domains (e.g., math) and that girls are "naturally" better in others (e.g., reading), even in cases where no gender differences in achievement exist (Bleeker & Jacobs, 2004; Eccles, 2009; Herbert & Stipek, 2005; Tomasetto et al., 2015). Recent research suggests that parents of babies (ages 10–18 months) make more references to math when talking to baby boys than to baby girls (Leech et al., 2021). Toys also are often marketed specifically for boys and girls; results of one study indicated that toys marketed on the Disney store website varied greatly by color, with bold-colored toys (e.g., red, black, brown, gray) marketed toward boys, and pastel-colored toys (e.g., pink, purple) marketed toward girls (Auster & Mansbach, 2012). Such gender-stereotypical toys and games can also have an impact: The dolls and board games that girls often get foster verbal and social skills, whereas the blocks and soccer balls that boys get are more apt to foster visual–spatial skills (Feng et al., 2007; Frost et al., 1998; Lytton & Romney, 1991). Figure 4.5 is a picture drawn by a fourth grader of the school playground. Do you see gender stereotypes already emerging?

Figure 4.5 A fourth grader's drawing of recess on the playground.



Boys' and girls' personality characteristics are socialized to some degree, too. Especially in cultural groups that espouse traditional gender roles, boys are often reinforced—by adults and peers—for being assertive and aggressive, whereas girls often are encouraged to be restrained and nurturing (Leaper & Friedman, 2007; Manning & Baruth, 2009; Rothbart, 2011). As educators, we need to be aware that students' families and cultures influence their beliefs about gender roles (Hoffman et al., 2019; Schroeder & Bámaca-Colbert, 2019). Similarly, television and video games often portray males as aggressive leaders and successful problem solvers, whereas females can be depicted as demure, obedient followers (Furnham & Mak, 1999; Leaper & Friedman, 2007; Miller & Summers, 2007; Thompson & Zerbinos, 1995). As young children become increasingly aware of the typical characteristics and behaviors of boys, girls, men, and women, they gradually pull their knowledge together into self-constructed understandings, or **gender schemas**, of how males and females are different. These gender schemas, in turn, become part of their sense of self and guide them in their choices and behaviors. By the time children reach school age, much of the pressure to act "appropriately" for their gender comes from within rather than from others (Bem, 1981; Eccles, 2009; Ruble et al., 2006).

The contents of students' gender schemas vary considerably from one individual to another (Liben & Bigler, 2002). For example, in adolescence, some girls incorporate into their "female" schema unrealistic standards of beauty presented in popular media (e.g., movies, fashion magazines, social media). As girls compare themselves to these standards, they almost invariably come up short, and their self-assessments of physical attractiveness decline. In attempting to achieve the super-thin bodies they believe to be ideal, they may fall victim to eating disorders (Attie et al., 1990; Weichold et al., 2003). Likewise, some teenage boys go out of their way to meet self-constructed standards of male behavior by putting on a tough-guy act at school and bragging (sometimes truthfully and sometimes not) about their many sexual conquests (Pollack, 2006; Williams, 2001). Moreover, peers often reinforce stereotypical gender schemas as they interact with one another (Muntoni et al., 2021).

Not all students have rigid or unrealistic stereotypes of what their gender should be like, of course. In fact, as students get older, many become increasingly flexible about what males and females can and should do. Those with more flexible gender schemas are more likely to pursue counter-stereotypical interests and career paths (Liben & Bigler, 2002; Martin & Ruble, 2004).

Making Appropriate Accommodations for Gender Differences

Despite teachers' best intentions to treat students equitably, subtle inequities continue. For example, teachers tend to give more attention to boys, partly because boys ask more questions and present more discipline problems. Teachers give boys more feedback—praise and criticism alike—than they give girls (Altermatt et al., 1998; Eisenberg et al., 1996; Gay, 2006; Halpern et al., 2007; Jones & Dindia, 2004). Teachers also tend to hold higher expectations for boys in some areas such as math and science (American Friends of Tel Aviv University, 2015; Newall et al., 2018), and for girls in some areas, such as reading (Muntoni & Retelsdorf, 2018). When teachers hold stereotypical beliefs of this nature, it can potentially have unintended consequences; for example, when teachers believe that girls are better at reading than are boys, boys' beliefs in their abilities as readers may actually decline over time (Retelsdorf et al., 2015).

Acknowledge that some differential treatment of girls and boys is appropriate, especially if it helps to *reduce* gender gaps in particular abilities and predispositions.

The Into the Classroom feature "Promoting Gender Equity" offers several general suggestions for equitably fostering the learning and development of all students. At the same time, gender differences sometimes *do* warrant differential treatment of girls and boys. For example, girls are likely to improve their visual–spatial ability if we give them frequent opportunities to engage in activities requiring visual–spatial thinking (Casey et al., 2008; Gallagher & Kaufman, 2005). Girls also are more likely to benefit from computer software used during mathematics instruction when such programs

Into The Classroom

Promoting Gender Equity

- **Use your knowledge of typical gender differences to create greater equity for males and females, not to form expectations about how well males and females are likely to perform in various activities.**

  An elementary physical education teacher realizes that most of the girls in her class probably haven't had as much experience as the boys in throwing a baseball or softball overhand, so she gives the girls extra instruction and practice in the overhand throw.

- **When planning lessons and instructional strategies, consider typical interests and activity levels of both boys and girls.**

  A sixth-grade math teacher teams up with his school's information technology teacher to create a month-long unit in which students learn how to use GameMaker, software that enables them to create simple video games using a variety of animated characters, graphics, and music. The students then work in small groups to design games that will help them practice a particular mathematical concept or skill. At the end of the unit, each group demonstrates its game for the class, and the teacher posts the games to the class website so that students can play them at home.

- **Use curriculum materials that represent both genders in a positive and competent light; include materials that portray both genders competently engaging in counterstereotypical behaviors.**

  An English teacher has her class read *The Hunger Games* and then watch the movie, in which Katniss Everdeen (the lead character) is portrayed as a fearless hero, and Peeta (her male partner in the games) is portrayed as strong but also as sensitive and compassionate. The teacher also assigns Zora Neale Hurston's *Their Eyes Were Watching God*, in which an African American woman evolves from a teenager who depends on others to meet her needs into a self-sufficient woman who can easily fend for herself.

- **Monitor yourself to see whether you are unintentionally treating boys and girls in ways that limit the learning opportunities of one gender.**

  A chemistry teacher decides to count the number of times he calls on boys and girls during class. He finds that he calls on boys more than three times as frequently as girls, partly because the boys raise their hands more often. Therefore, he institutes a new procedure: He alternates between boys and girls when he calls on students, and he sometimes calls on students who aren't raising their hands.

- **Consider asking your students about their preferred personal pronouns.**

  A high school language arts teacher has her students complete a brief online survey the first day of school. The survey explains to students that personal pronouns are a personal choice and asks each student to inform the teacher of their preferences.

include female characters and when those programs provide help options for users (Arroyo et al., 2013). Boys are more likely to improve their literacy skills if we allow them to pursue typical "boy" interests (e.g., sports, adventure) while reading and writing (Newkirk, 2002). In recent years, some educators have advocated for single-sex schools. There may be some social benefits to such settings, but math and science achievement do not appear to be affected by attending a single-sex school (Pahlke et al., 2013). Overall, we must be extremely careful and thoughtful about differential treatment of our students—if students perceive that they are being discriminated against because of their gender, they may suffer in unexpected ways. For example, results of one recent large-scale study indicated that during the middle school years, when girls experience discrimination at school based on their gender, they may subsequently feel that school is unfair, and experience depressive symptoms and sleep loss (Bell & Juvonen, 2020).

We must also help students recognize that gender stereotypes are just that—*stereotypes*—and don't necessarily limit what males and females can or should be. For example, we can:

- Expose students to same-gender adults and peers who excel in careers commonly associated with the opposite gender.
- Talk about the importance of all academic subject areas for students' future success.
- Explain the historical roots of stereotypes. For instance, explain that differing expectations for males and females are a holdover from an era when many jobs outside

the home required considerable strength (and thus were better suited for men) and jobs inside the home could easily be combined with breastfeeding (and thus were better suited for women).

- Consider intersectionality. Don't lose sight of the many diverse characteristics of your students. Remember that each of your students also has many other identities (e.g., the student's ethnicity, religion, age).
- Engage students in discussions about the adverse consequences of rigid gender roles—noting, for example, that adhering to such roles limits people's options and results in a lot of talent going to waste (Bem, 1983, 1984; Evans-Winters & Ivie, 2009; Fennema, 1987; Ghavami & Peplau, 2018; Huguet & Régner, 2007; Kelly & Smail, 1986; Li & McLellan, 2021; Pollack, 2006).

Socioeconomic Differences

Learning Objective 4.3 Identify challenges that students from low-income families often face. Also identify several strategies through which you can foster their resilience and help them be successful at school.

The concept of **socioeconomic status (SES)** encompasses a number of variables, including family income, parents' education levels, and parents' occupations. A family's socioeconomic status—whether high-SES, middle-SES, or low-SES—gives us a sense of family members' experiences within the community: what type of neighborhood they live in, how much influence they have on political decision making, what educational opportunities are available to them, and what resources they have available in their homes.

Students' school performance is correlated with their socioeconomic status: Higher-SES students tend to have higher academic achievement, and lower-SES students tend to be at greater risk for dropping out of school (Crook & Evans, 2014; Curran, 2017; Lee & Bowen, 2006; Loft & Waldfogel, 2021; Sirin, 2005; Tucker-Drob, 2013). As students from lower-SES families move through the grade levels, they often fall further and further behind their higher-SES peers (American Psychological Association, 2012; Farkas, 2008; Jimerson et al., 1999). Lower-SES students often live in neighborhoods with fewer economic and educational resources, both of which contribute to lower achievement for these students (Dupere et al., 2010). Internationally, the relations between SES and academic outcomes are stronger in wealthier countries than in developing countries (Kim et al., 2019).

When researchers find achievement differences among students from different ethnic groups, the differences in the students' socioeconomic status—*not* their cultural differences—seem to be mostly to blame (Byrnes, 2003; Hill et al., 2003; Murdock, 2000). It is important not to make assumptions about the relationship between a student's ethnic background and socioeconomic status; the relationships among SES, ethnic background, and school achievement are often complex, and depend on many other factors (e.g., students' age) (Henry et al., 2020).

Nevertheless, life certainly isn't perfect for students from high-SES homes (Luthar, 2006; Luthar & Latendresse, 2005). Some high-income parents have such high expectations for their children's achievement that the children suffer from significant anxiety and depression. Students in high-income homes often feel excessive pressure to cheat in order to be successful and to keep up with their peers (Anderman, 2018; Galloway, 2012). In addition, some high-income parents have demanding jobs that keep them both physically and emotionally distant from their children, thereby limiting the guidance and support they provide. Overall, however, it is children who live in poverty, especially *chronic* poverty, who face the most significant obstacles to academic success and personal well-being. As an example, consider the following scenario:

Experiencing Firsthand

Homework on the Internet

Imagine that you are teaching fifth grade in an elementary school that has adopted a fully online mathematics program. Your school has adequate technology resources, and your students are able to work on computers in school every day. In addition, all of the homework assignments are completed online.

Cindy, a student in your class, approaches you and says, “I don’t have Internet at home.” She then adds, “I don’t even have a computer; my family says we can’t afford one.”

What should you do?

Unfortunately, this situation is not uncommon. As more schools are adopting curricula that are provided solely online, access to the Internet is becoming essential. Nevertheless, students from low-SES backgrounds are less likely to have this access. For some families, the only alternative is to take their children to local libraries to use computers that are available at those locations to do their homework. Having to take a child to a library every night to do homework, however, maybe very stressful, particularly for parents who also work full time or do not have transportation. As teachers, we can provide students like Cindy with alternative resources. For example, we can print out the assignments for these students and send home paper copies.

Challenges Associated with Poverty

Many, many children grow up in poverty. As of 2020, one in six children globally lives in extreme poverty (UNICEF, 2020). In the United States, children are the poorest age group in the country, with nearly 1 out of 7 children living in poverty; moreover, the number of children living in poverty has increased even more since the onset of the COVID-19 pandemic (Annie E. Casey Foundation, 2019a; Children’s Defense Fund, 2021). Children are two times more likely than adults over the age of 65 to live in low-income households (National Center for Children in Poverty, 2021), and over 70% of children living in poverty are children of color (Children’s Defense Fund, 2021). Some of these children live in inner-city neighborhoods, but others live in rural areas or in modest apartments in wealthy suburbs. Some come from families that can meet life’s basic necessities (e.g., food, warm clothing, adequate shelter) but have little money left over for luxuries. Many others live in extreme poverty; these students are the ones most at risk for academic failure and thus most in need of our attention and support.

Students who face only one or two of these challenges often do quite well in school, but those who face many or all of them are at high risk for academic failure and other negative outcomes (Becker & Luthar, 2002; Gerard & Buehler, 2004; Grissmer et al., 1998). Adolescents who grow up in poverty tend to see themselves as low in social status; these negative self-beliefs often increase over time, potentially leading to subsequent psychological and physiological ailments (Rahal et al., 2020). This became glaringly evident during the COVID-19 pandemic—students from lower-SES backgrounds experienced greater learning losses overall than students from higher-SES backgrounds (UNICEF, 2021).

Poor Nutrition and Health. Lower-income families have fewer financial resources to ensure that their children have adequate nutrition and health care. Poor nutrition in the early years of life (including the nine months before birth) can lead to impairments in children’s attention, memory, and learning ability (Aboud & Yousafzai, 2015; Noble et al., 2005). Poor nutrition seems to influence school achievement both directly—for

Help families apply for free and reduced-cost meal programs. Refer students with chronic health problems to the school nurse or a social worker.

example, by hampering early brain development—and indirectly—for example, by leaving children listless and inattentive in class (Ashiabi & O'Neal, 2008; Sigman & Whaley, 1998). School performance also suffers when youth are not able to have breakfast, and when they do not consume adequate amounts of fruit, vegetables, and dairy (CDC, 2014). Furthermore, inadequate health care means that some conditions that interfere with school attendance and performance, such as asthma and hearing problems, go unaddressed (Berliner, 2005).

Inadequate Housing and Frequent Moves. Many poor children live in tight quarters, perhaps sharing one or two rooms with several other family members (Hawkins, 1997; Hernandez et al., 2008). High housing costs place burdens on families that limit the amount of money that can be spent on food, educational activities, and other necessities (Annie E. Casey Foundation, 2019b). Furthermore, children who move frequently from one rental apartment to another must often change schools as well. In the process, they lose existing social support networks—both with teachers and with peers—and may miss lessons on fundamental academic skills (Croninger & Valli, 2009; Gruman et al., 2008; Hattie, 2009).

Exposure to Toxic Substances. In poor, inner-city neighborhoods, children's surroundings may expose them to excessive levels of environmental toxins that can seriously jeopardize their health and brain development (Hubbs-Tait et al., 2005; Koger et al., 2005). For example, in old, badly maintained apartment buildings, children may be exposed to lead in the dust from deteriorating paint. In addition, the city water supply may contain pesticides or industrial waste, and the local air may be polluted by power plants and industrial incinerators.

Unhealthy Social Environments. On average, low-SES neighborhoods and communities have higher frequencies of violence and vandalism, greater prevalence of alcoholism and drug abuse, and greater numbers of antisocial peers. Furthermore, there are fewer productive outlets for leisure time—libraries, recreation centers, sports leagues, and so on—and fewer positive adult role models. Such factors appear to be partly responsible for the lower academic achievement of students who live in poverty (Aikens & Barbarin, 2008; Cook et al., 2002; Duncan & Magnuson, 2005; Leventhal & Brooks-Gunn, 2000; Milam et al., 2010; Nettles et al., 2008).

Emotional Stress. Students at all income levels experience stressful conditions at one time or another, but students from low-income families have more than their share. On average, low-SES homes are more chaotic and unpredictable than affluent ones. Children may wonder where their next meal is coming from or when the landlord might evict their family for not paying rent. They may live with family members who are addicted to illegal substances (e.g., opioids). The preponderance of single-parent homes among low-SES families can come into play as well: A single parent juggling multiple responsibilities and personal problems may struggle to offer consistent affection and discipline. As a result of such factors, students from low-SES families show higher-than-average rates of depression and other emotional problems (Crosnoe & Cooper, 2010; Evans et al., 2005; Foulds et al., 2014; Joynt et al., 2013; King et al., 2014; Morales & Guerra, 2006; Parke et al., 2004). Sometimes, too, chronic stress adversely affects students' physical development, which in turn can hamper their cognitive development (Evans & Schamberg, 2009).

Provide emotional support and appropriate referrals when students seem to be undergoing exceptional stress at home.

Not all children from low-income homes live in chronically stressful conditions, of course, and those whose families provide consistent support, guidance, and discipline generally enjoy good mental health (Hill et al., 2003; Wright & Masten, 2006). Nevertheless, we should continually be on the lookout for signs that students are experiencing unusual stress at home and then provide whatever support we can. In some instances, effective support may involve nothing more than being a willing listener. In other cases, we may want to consult with a school counselor, school psychologist, or social worker about possible support systems at school and resources in the local community.

Gaps in Background Knowledge. Some students from low-SES families enter school lacking the basic knowledge and skills (e.g., knowledge of letters and numbers) on which successful school learning so often depends (Aikens & Barbarin, 2008; Brooks-Gunn et al., 2005; Coley et al., 2020; Siegler & Chen, 2008). Access to early educational opportunities that might foster such skills—books, computers, summer programs, trips to zoos and museums, and so on—is always somewhat dependent on a family's financial resources. In addition, some parents have limited basic academic skills themselves to share with their children. Moreover, parents in low-SES households often must spend long hours working, thus limiting the quality time that they can spend with their children. This sometimes results in children not having ample opportunities to engage in conversations, which can delay the development of linguistic skills that are related to subsequent success in school (Romero et al., 2018; Zhang et al., 2019). As always, however, we must be careful not to overgeneralize. Some low-income parents have considerable education and may be well equipped to read to their children and provide other enriching educational experiences (Goldenberg, 2001; Raikes et al., 2006; Sidel, 1996). Moreover, some programs have been designed with the goal of providing parents of young children (i.e., children who are between the ages of two and three) with training on how to interact with toddlers to develop skills that will prepare them for future academic success; when well delivered, these programs can be highly effective (List et al., 2021).

Identify and address any missing basic skills.

Lower-quality Schools. Unfortunately, the students who most need good schools are often least likely to have them. Schools in low-income neighborhoods and communities tend to receive less funding and, as a result, are often poorly equipped and maintained. Teacher turnover rates are high in these schools, and disciplinary tactics tend to be harsher and less effective. Furthermore, some teachers at these schools have low expectations for students, offering a less-challenging curriculum, assigning less homework, and providing fewer opportunities to develop advanced thinking skills than do teachers in wealthier school districts (Evans, 2004; McLoyd, 1998; Pianta & Hamre, 2009; Raudenbush, 2009).

Of course, schools in low-income school districts don't have to be this way. In fact, we teachers can make a *huge* difference in the quality of children's educational experiences at even the poorest of schools. Consider a teacher whom researchers called Miss A (Pedersen et al., 1978):

> Miss A taught at Ray School, an elementary school in a large, North American city. The school building—constructed like a fortress, with iron bars on its windows—was hardly appealing or welcoming. Its neighbors included old tenement buildings, a junkyard, and a brothel. Fewer than 10% of its students eventually completed high school.
>
> Nonetheless, Miss A worked wonders with the students in her first-grade classes. She showed obvious affection for them, insisted on appropriate behavior without ever losing her temper, and shared her lunch with those who hadn't brought one. She continually hammered home the importance of learning and education and had high expectations for achievement. She made sure her students learned to read, and she stayed after school with them whenever they needed extra help.
>
> Miss A's students got higher grades than students in other classes not only in their first-grade year but also for several years after that. On average, their IQ scores went *up* between third and sixth grade (one girl's score changed from 93 to 126), whereas the IQs of most students at Ray School went down. When researchers tracked down some of Miss A's students many years later, they found that these students were far more financially and professionally successful than the typical Ray graduate. And every single one of them remembered her name.

Be optimistic that you *can* make a difference in students' lives.

Fostering Resilience

Remember that many bright, capable students come from low-income families.

Thanks in part to teachers like Miss A, many students of low-income families succeed in school despite exceptional hardships. Some are **resilient students** who acquire characteristics and coping skills that help them rise above their adverse circumstances. As a group, resilient students have likable personalities, a positive sense of self, and ambitious goals, and they believe that success comes with hard work and a good education (Goldstein & Brooks, 2006; Schoon, 2006; Werner & Smith, 2001).

Researchers have learned a great deal about factors that can foster resilience in students from challenging backgrounds. With their findings in mind, we offer the following suggestions.

- *Be a dependable source of academic and emotional support.* Resilient students usually have one or more individuals in their lives whom they trust and can turn to in difficult times (Masten, 2001; McLoyd, 1998; Werner, 1995, 2006). For example, resilient students often mention teachers who have taken a personal interest in them and been instrumental in their school success (McMillan & Reed, 1994; O'Donnell et al., 2002). As teachers, we're most likely to promote resilience in low-SES students when we show that we like and respect them, are available and willing to listen to their concerns, hold high expectations for their performance, and provide the encouragement and support they need to succeed both inside and outside the classroom (Kincheloe, 2009; Masten & Coatsworth, 1998; Milner, 2006; Schoon, 2006). In particular, we need to be aware of our own expectations for low-SES students, as they can affect our interactions with and assessments of these students (Westphal et al., 2016).
- *Build on students' strengths.* Although some students from lower-SES backgrounds may lag behind in basic academic skills, they also bring many strengths to the classroom. For example, these students are often quite clever at improvising with everyday objects. If they hold part-time jobs to help their families make ends meet, they may have a good understanding of the working world. If they are children of single, working parents, they may know far more than their classmates about cooking, cleaning house, and taking care of younger siblings. Such experiences may lead to greater levels of maturity and personal responsibility. Their own scarce resources are likely to have instilled genuine empathy for and generosity toward other people in need (Freedom Writers, 1999; Kraus et al., 2011; Lareau, 2003).

  As teachers, then, we must remember that students who have grown up in poverty may, in some respects, have more knowledge and skills than their economically advantaged peers. Such knowledge and skills can often provide a basis for teaching (Schoon, 2006; Varelas & Pappas, 2006). Students who are willing to talk about challenges they have faced can sensitize their classmates to serious inequities in today's society.
- *Identify and provide missing resources and experiences important for successful learning.* Some students from poor families lack basic essentials—such as nutritious meals, warm clothing, adequate health care, and school supplies—that are essential for their academic success. Many government programs and community agencies can help to provide such essentials. School districts offer free and reduced-cost meal programs for children from low-income families; some even offer these during the summer and school breaks, when school is not in session. Charitable organizations often distribute warm winter jackets gathered from annual clothing drives. Many communities have low-cost health clinics and local food pantries. And some office supply stores and large discount chains donate school supplies to children who need them.

  Beyond connecting low-income students and families with community resources, we should identify any basic experiences that students may not have had. Field trips to zoos, farms, the mountains, or the ocean may be in order. And of course, we should identify and teach any basic skills that, for whatever reason, students haven't acquired. Furthermore, sometimes students from lower-SES backgrounds will need extra support in learning to use strategies that are essential for success in school (e.g., learning how to work independently and learning how to be organized) (Robinson, 2013). When we provide these supports, we're likely to see significant improvements in performance (Deer et al., 2020; Phillips et al., 2004; Siegler, 2009). However, we must be careful not to focus *exclusively* on basic skills, especially when doing so means a fair amount of drill and practice. Students' academic progress will suffer over the long run if they don't also have frequent opportunities to engage in complex and enjoyable academic tasks, such as reading for understanding, mastering new technologies, and solving real-world problems (Cazden, 2001; Reis et al., 2011).

Balance any needed instruction in basic skills with challenging and engaging real-world activities.

Working with Homeless Students

The number of homeless students attending public schools has increased in recent years, and in 2020, almost 1.3 million students were homeless (National Center for Education Statistics, 2021; National Center for Homeless Education, 2021; National School Boards Association, 2021). Children of homeless families typically face far greater challenges than other students from low-income families. Many have chronic physical problems, limited social support networks, and significant mental health issues, and engage in inappropriate behaviors. Some may be reluctant to come to school because they lack bathing facilities and suitable clothing, and some may even be runaways. Others may have moved so frequently from one school to another that they have large gaps in their academic skills (McLoyd, 1998; Miller, 2011; Polakow, 2007).

As teachers, we also face extra challenges when teaching students who live in homeless shelters. Following are several suggestions for giving these students the support they may need to achieve academic and social success at school (Pawlas, 1994):

- Pair new students with classmates who can provide guidance and assistance—for example, by explaining school procedures and making introductions to other students.
- Provide a notebook, clipboard, or other portable "desk" on which students can do their homework at the shelter.
- Find adult, college student, or teenage volunteers to serve as tutors at the shelter.
- Meet with students' parents at the shelter rather than at school.
- Share copies of homework assignments, school calendars, and newsletters with shelter officials.

When we use such strategies, however, we must keep in mind that students and their families are apt to feel embarrassed about their homeless status, and that these parents are dealing with numerous other serious problems (Polakow, 2007; Wu et al., 2018). Accordingly, showing respect for their privacy and self-esteem must be a high priority. If you believe that a student may have run away from home, contact professionals in your school (e.g., school social workers, school counselors, or school psychologists) who may be able to assist by finding appropriate resources for the student. Sometimes these students can be admitted into a temporary facility for homeless or runaway youth, which may provide short-term benefits (Slesnick et al., 2009).

Students at Risk

Learning Objective 4.4 **Explain how you might recognize students who are at risk for academic failure and dropping out of school, and identify strategies for helping these students stay in school and get on the path to academic and social success.**

Students at risk are those with a high probability of failing to acquire the minimum academic skills necessary for success in the adult world. Many students at risk drop out before high school graduation, and many others graduate without mastery of basic skills in reading or mathematics (e.g., Boling & Evans, 2008; Laird et al., 2007; U.S. Department of Education, 2015). In the United States, dropout rates have decreased over the past 25 years, from 12.1% in 1990 to 5.1% in 2019. Although dropout rates have declined overall, dropout rates for students of color are higher than for White and Asian American students (Institute of Education Sciences, 2019).

Some students are at risk for dropping out of school earlier than are others. A common assumption is that the reasons for dropping out lie primarily in the students themselves (Lee & Burkam, 2003). But as we will see, school characteristics also play a significant role. Some schools have been referred to as "dropout factories" (American Psychological Association, 2012). These schools have extraordinarily high dropout rates, and many are in areas of high poverty. Data suggest that in the United States, there are about 2,000 high schools in which the ninth-grade class decreases by at least 40% by the time those students should be high school seniors (Balfanz & Legters, 2004).

Characteristics of Students at Risk

Students at risk come from all socioeconomic levels, but children of poor, single-parent families are especially likely to leave school before high school graduation. Boys are more likely than girls to drop out, and rates differ across ethnic groups, although that gap is narrowing. Also, students in large cities and rural areas are more likely to drop out than students in the suburbs; graduation rates in some big cities are less than 40% (Chapman et al., 2010; DePaoli et al., 2015; Hardré & Reeve, 2003; Miller, 1995; National Research Council, 2004).

Students at risk, especially those who eventually drop out, typically have some or all of the following characteristics:

- *A history of academic failure.* On average, students who are at risk and who ultimately drop out have poorer reading and study skills, achieve at lower levels, have less confidence in their academic ability, and are more likely to have repeated a grade than their classmates who graduate. Consistent patterns of low achievement are sometimes seen as early as third grade. Young children who experience comorbid difficulties with both reading and math are particularly at risk for academic difficulties (Barnes et al., 2020; Christle et al., 2007; Fan & Wolters, 2012; Hattie, 2009; Korhonen et al., 2014; Suh et al., 2007). The below average growth in reading skills experienced by many students during the COVID-19 pandemic may have long-term effects and put additional students at risk for academic failure if not remediated appropriately (Domingue et al., 2021).
- *Emotional and behavioral problems.* Potential dropouts tend to have lower self-esteem than their more successful classmates. They're also more likely to exhibit serious behavioral problems (e.g., fighting, substance abuse) both in and out of school. Often their close friends are low achieving and, in some cases, antisocial peers (Battin-Pearson et al., 2000; Garnier et al., 1997; Jozefowicz et al., 1994; Suh et al., 2007).
- *Lack of psychological attachment to school.* Students at risk for academic failure are less likely to identify with their school or to perceive themselves as being a vital part of the school community. For example, they engage in few extracurricular activities and are apt to express dissatisfaction with school in general (Christenson & Thurlow, 2004; Hymel et al., 1996; Rumberger, 1995).
- *Increasing disengagement with school.* Dropping out isn't necessarily an all-or-nothing event. Many high school dropouts show lesser forms of dropping out many years before they officially leave school. Future dropouts are absent from school more frequently than their peers, even in the elementary grades. In addition, they're more likely to have been suspended from school and to show a long-term pattern of

dropping out, returning to school, and dropping out again (Christenson & Thurlow, 2004; Suh et al., 2007).

The characteristics just described certainly aren’t definitive indicators of which students will drop out, however. For example, some dropouts come from two-parent, middle-income homes, and some are actively involved in school activities almost until the time they drop out (Hymel et al., 1996; Janosz et al., 2000). We also need to be aware of the risks experienced by students who are sexual minorities. While these students are certainly not all at risk, many experience stressors that place them at risk. Students who may be gay, lesbian, bisexual, transgender, or gender-nonconforming are particularly at risk of experiencing family rejection, teasing, psychological distress, violence, depression, and academic failure (Bariola et al., 2015; Eisenberg et al., 2017; Hanson et al., 2019; Hicks & Pecoraro, 2021; Perry & Green, 2014; The Trevor Project, 2019).

Why Students Drop Out

Students drop out for a variety of reasons, and they are not always academic reasons. Some have little family and peer encouragement and support for school success; others have extenuating life circumstances; perhaps they have medical problems, take a job to help support the family, become depressed, or get pregnant. Many simply become dissatisfied with school: They find the school environment unwelcoming or dangerous, perceive the curriculum to be boring and personally irrelevant, become victims of teasing or bullying, are absent often, or doubt that they can pass the high-stakes achievement tests on which graduation depends (Balfanz et al., 2007; Brayboy & Searle, 2007; Hardré & Reeve, 2003; Hursh, 2007; Quiroga et al., 2013; Samuel & Burger, 2020).

Chapter 15 looks more closely at the effects of high-stakes testing.

Sadly, teacher behaviors can enter into the picture as well. For example, a teacher might communicate low expectations for students’ achievement either explicitly (e.g., by telling them that their chances of earning passing grades are slim) or implicitly (e.g., by brushing off their requests for assistance on assigned tasks). Teachers and administrators sometimes forget how important it is for them to talk to and care about students who may be at risk academically. One student stated that he dropped out because

> Teacher didn’t care, principal didn’t care . . . I told my counselor and a couple teachers, but I didn’t want to because they didn’t care . . . you know from the way that they come at me on a regular basis . . . they don’t try to talk to me. (America’s Promise Alliance, 2018)

Students are more likely to drop out when they perceive their teachers to be uninterested in helping them succeed (Becker & Luthar, 2002; Farrell, 1990; Suh et al., 2007).

Supporting Students at Risk

Because students who are at risk for academic failure are a diverse group with diverse needs, there is no single strategy that can keep all of them in school until high school graduation (Christenson & Thurlow, 2004; Janosz et al., 2000). Nevertheless, effective school and classroom practices will go a long way in helping these students stay on the road to academic success and high school graduation. Following are several suggestions based on research findings.

- *Identify students at risk as early as possible.* We begin to see indicators of dropping out, such as low achievement and high absenteeism, as early as elementary school. And other signs—such as disruptive behavior and lack of involvement in school activities—often appear years before students officially withdraw from school. Therefore, it’s quite possible to identify at-risk students early in their school careers and take steps to prevent or remediate academic difficulties before they become insurmountable. Schools can integrate methods for identifying these at-risk students in their data systems so that each student's progress over time can be easily tracked. For students at risk, prevention, early intervention, and long-term support are more effective at the early stages than later, short-term efforts (Brooks-Gunn, 2003; Christenson & Thurlow, 2004; Institute of Education Sciences, 2008; Jeon et al., 2018; Smith et al., 2016; Williams et al., 2016).

- *Create a warm, supportive school and classroom atmosphere.* Teachers and schools that have high success rates with students at risk tend to be those who communicate a sense of caring, concern, and high regard for students (Christenson & Thurlow, 2004; Hamre & Pianta, 2005; Pianta, 1999). Particularly useful is the provision of specific adult advocates who are assigned to help at-risk students. The relationships that students develop with these advocates can be effective in identifying resources to help the students with both short-term and longer-term needs (Institute of Education Sciences, 2008).

Chapter 12 offers many strategies for creating warm, emotionally supportive schools and classrooms.

- *Make long-term, systematic efforts to engage students in the academic curriculum.* Students are more likely to stay in school and more likely to learn and achieve at high levels if they think their classes are worth their time and effort (e.g., Anderson & Pellicer, 1998; Institute of Education Sciences, 2008; Miller, 2003; Ramey & Ramey, 1998; Suh et al., 2007). When we notice that a student has not mastered an essential skill, it's incredibly important that we take the time to ensure that they receive appropriate remediation (e.g., tutoring) so that they do not fall further behind and eventually just give up. The Into the Classroom feature "Engaging Students at Risk in the Academic Curriculum" offers several concrete examples of what we might do.
- *Encourage and facilitate identification with school.* Students are far more likely to stay in school if they have an emotional attachment to their school and believe that they're important members of the school community (Christenson & Thurlow, 2004; Fredricks et al. 2004). Following are several strategies that researchers have found to be effective:
  - Encourage participation in athletic programs, extracurricular activities, and student government. In some instances, this may mean providing extra supports to allow participation, such as assistance with transportation or supplementing the cost of a uniform. This strategy is especially important when students are having academic difficulties, because it provides an alternative way of experiencing school success.
  - Involve students in school policy and management decisions.
  - Give students positions of responsibility in managing school activities.
  - Monitor students' attendance, and when students are persistently absent from school, discuss the absences with the student and consult with others (e.g., school counselors) to intervene if necessary (Eccles, 2007; Finn, 1989; Garibaldi, 1992; Newmann, 1981; M. G. Sanders, 1996).

In general, then, the most effective programs for students at risk are those that would be ideal for *any* student.

Into The Classroom

Engaging Students at Risk in the Academic Curriculum

- **Pique students' interest with stimulating activities.**

  In a unit on the physics of sound, a middle school science teacher shows students how basic principles of sound reveal themselves in popular music. On one occasion, the teacher brings in a guitar and explains why holding down a string at different points along the neck of the guitar creates different frequencies and thus different notes.

- **Make the curriculum relevant to students' lives and needs—for example, through service learning activities.**

  A math teacher at an inner-city middle school consistently encourages her students to identify and work to solve problems in their community. One of her classes expresses concern about the many liquor stores located near the school and the questionable customers and drug dealers the stores attract. The students use yardsticks and maps to calculate the distance of each store from the school, gather information about zoning restrictions and other city regulations, identify potential violations, meet with a local newspaper editor (who publishes an editorial describing the situation), and eventually meet with legislators and the city council. As a result, police begin to monitor the liquor stores more closely and they identify major violations (leading to the closing of two stores); finally, the city council makes it illegal to consume alcohol within 600 feet of the school.

- **Create a community of learners—a classroom in which students and teachers work collaboratively to increase everyone's understanding.**

  In a high school science class's unit on weather, small groups of students specialize in different topics (e.g., humidity, wind, air pressure). Each group conducts research about its topic and then prepares a lesson to teach the rest of the class what they have learned.

- **Use students' strengths to promote a positive sense of self.**

  Staff at a low-income, inner-city elementary school form a singing group that students can join. The group performs at a variety of community events, and the students enjoy considerable visibility. Group members exhibit increased self-confidence, improvement in other school subjects, and greater teamwork and leadership skills.

- **Communicate high expectations for short-term and long-term academic success.**

  A math teacher at an urban high school recruits students to participate in an intensive math program. The teacher and students work on evenings, Saturdays, and vacations, and all of them later pass the Advanced Placement calculus exam. (This real-life example is depicted in the 1988 film *Stand and Deliver*.)

- **Provide extra support for academic success.**

  A middle school homework program meets every day after school in Room 103, where students find their homework assignments on a shelf. Students follow a particular sequence of steps to do each assignment (assembling materials, having someone check their work, etc.) and use a checklist to make sure they don't skip any steps. Initially, a supervising teacher closely monitors what they do, but with time and practice the students are able to complete their homework with only minimal help and guidance.

SOURCES: Allen & Antonishak, 2008; Anderman & Anderman, 2021; Anderson & Pellicer, 1998; Belfiore & Hornyak, 1998 (homework program example); Christenson & Thurlow, 2004; Cosden et al., 2001; Evans-Winters & Ivie, 2009; Fuchs et al., 2008; Jenlink, 1994 Jazz Cats example; Kincheloe, 2009; Ladson-Billings, 1994; Mathews, 1988 (inner-city math program example); Suh et al., 2007; Tate, 1995 (liquor store example).

Chapter 4 What Have You Learned?

We now return to the chapter's learning outcomes and identify key points associated with each. As we do so, we must remember three critical principles regarding the group differences described in this chapter: There is considerable individual variability within any group, a great deal of overlap between any two groups, and additional variability across locations.

4.1 **Describe frequently observed between-group differences and within-group variability for various cultural and ethnic groups. In addition, describe the teacher attitudes and strategies that underlie culturally responsive teaching.** Cultural and ethnic-group differences may be seen in language and dialect, talkativeness and verbal assertiveness, eye contact, personal space, responses to questions, comfort with public performance, views about teasing, attitudes toward cooperation and competition, use of technology, family relationships and expectations, conceptions of time, and worldviews. For students from culturally and ethnically diverse groups, there is often some degree of cultural mismatch between the home and school environments, and teachers' misinterpretations of students' behaviors can exacerbate this mismatch. All students benefit when we promote increased understanding of cultural and ethnic differences and foster social interaction among students from diverse students.

4.2 Describe the nature and origins of typical gender differences in school-age children and adolescents, and explain how you might best accommodate such differences in your classroom. On average, males and females have similar academic abilities but differ somewhat in physical activity levels, experiences with technology, motivation, sense of self, interpersonal relationships, classroom behavior, and career aspirations. Biological differences account for a few gender differences, but socialization (which can amplify small biology-based differences) is at the root of many others. As teachers, we may occasionally need to tailor instructional strategies to the unique characteristics of boys versus girls, and we also need to be aware of students' developing gender identities, which may change over time. In general, we should hold equally high expectations for all students and make sure that all have equal opportunities to develop in every area of the school curriculum.

4.3 Identify challenges that students from low-income families often face. Also, identify several strategies through which you can foster their resilience and help them be successful at school. Numerous factors can contribute to the generally lower achievement of students from low-income families, including poor nutrition and housing, unhealthy physical and social environments, emotional stress, lower-quality schools, gaps in basic knowledge and skills, and homelessness. Despite such challenges, many children from low-income backgrounds have a positive sense of self and do well in school; such *resilient students* often have one or more individuals in their lives whom they trust and can turn to in difficult times. As teachers, we can help students in lower socioeconomic groups succeed by building on their many strengths and providing the academic and emotional support they may sometimes need to overcome their adverse circumstances.

4.4 Explain how you might recognize students who are at risk for academic failure and dropping out of school, and identify strategies for helping these students stay in school and get on the path to academic and social success. *Students at risk* are those with a high probability of failing to acquire the minimum academic skills necessary for success in the adult world; they may graduate from high school without having learned to read or write, or they may drop out before graduation. To help such students succeed at school, we should identify them as early as possible, make the curriculum relevant to their needs and interests, communicate high expectations for academic success, assign an advocate to work specifically with each student when possible, provide sufficient support to make such success possible, and encourage involvement in school activities.

Practice for Your Licensure Exam

The Active and the Passive

Ms. Stewart has noticed that only a few students actively participate in her middle school science classes. When she asks a question, especially one that requires students to draw inferences from information presented in class, the same hands always shoot up. She gives the matter some thought and realizes that all of the active participants are White and most of them are boys.

She sees the same pattern in students' involvement in lab activities. When she forms small groups for particular lab assignments, the same students (notably, the White males) always take charge. The females and male students of color take more passive roles, either providing assistance to the group leaders or just sitting back and watching.

Ms. Stewart is a firm believer that students learn much more about science when they participate in class and when they engage in hands-on activities. Consequently, she is concerned about the lack of involvement of many of her students. She wonders whether they really even care about science.

1. Constructed-response question:

Effective teachers place a high priority on *equity*—that is, they ensure that their classroom practices are not biased in ways that enhance some students' achievement more than others'. In this situation, the White boys appear to be benefiting more from instruction than their classmates are. Using what you know about group differences, identify at least three possible reasons that underrepresented students are not actively participating in classroom lessons.

2. **Multiple-choice question:**

   Three of the following explanations are possible reasons that the boys in Ms. Stewart's class are participating more than the girls. Which alternative *contradicts* research findings on gender differences?

   a. On average, boys are more motivated to get good grades.
   b. On average, boys are more physically active in their classes.
   c. On average, boys tend to be more confident about their abilities.
   d. On average, boys are more likely to speak up without waiting to be called on.

3. **Constructed-response question:**

   Describe three different strategies you might use to increase the participation of both girls and students of color in Ms. Stewart's class.

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 5

Individual Differences and Special Educational Needs

FatCamera/E+/Getty Images

Learning Objectives

5.1 Describe various perspectives on the nature of intelligence and identify several ways in which you can nurture intelligence in your own students.

5.2 Explain how students' cognitive styles and dispositions might influence their classroom performance.

5.3 Identify implications of the U.S. Individuals with Disabilities Education Act (IDEA) for your own work as a teacher.

5.4 Explain how you might adapt your instruction and classroom practices to the unique strengths and limitations of students with various disabilities.

5.5 Explain how you might nurture the development of students who show exceptional gifts and talents.

CASE STUDY

Tim

In elementary school, Tim earned reasonable grades despite poor reading comprehension skills. Although he often appeared to be in a daze during classroom activities, he was generally well behaved. In middle school, his grades began to decline and teachers complained of his "spaciness" and tendency to daydream. He had trouble staying on task and was so disorganized that he seldom completed homework. When Tim reached high school, he seemed unable to cope with the independence his teachers expected of students, and he failed several ninth- and tenth-grade classes.

Now, as a 17-year-old eleventh grader, Tim undergoes an in-depth psychological evaluation at a university diagnostic clinic. An intelligence test yields a score of 96, reflecting average ability, and measures of social and emotional adjustment are also within an average range. However, measures of attention consistently show this to be an area of weakness. Tim explains that he has trouble ignoring distractions and must find a very quiet place to do his schoolwork. Even then, he says, he often has to reread something several times to grasp its meaning. (Based on Hathaway et al., 2006, pp. 410–412).

- Tim's attention problems have obviously been interfering with his academic achievement. But if you look closely at the facts presented in the case, you might realize that Tim also has strengths on which teachers can build. What particular characteristics might be working in Tim's favor?
- As a teacher, how might you adapt your instructional strategies and classroom environment to accommodate Tim's unique needs?

The clinic evaluation team eventually concludes that Tim has attention-deficit hyperactivity disorder, or ADHD (like Tim, some students identified as having ADHD exhibit attention problems *without* hyperactivity). The team suspects that a learning disability might be at the root of the problem but doesn't have sufficiently precise diagnostic techniques to determine this with certainty. On the plus side, Tim is motivated to do well in school: He's well behaved in class, seeks out quiet places to study, and may read something several times in an effort to make sense of it. With appropriately modified instruction and settings—for example, teaching Tim basic organizational skills, breaking a single complex task into several shorter and simpler ones, and giving him a quiet place to read and study—Tim can more readily stay on task and complete assignments (Barkley, 2006; Meltzer, 2007).

Teachers have many diverse responsibilities, and meeting the needs of students like Tim may make prospective teachers feel somewhat anxious. As we will see, students show significant **individual differences** in various domains, including cognitive abilities, personalities, and physical skills. In this chapter, we'll look at individual differences in intelligence, cognitive styles, and dispositions. We'll then consider *students with special needs*—students who, like Tim, are different enough from their peers that they require specially adapted curriculum materials, instructional practices, or both. As we go along, we'll find that the most effective instruction tends to be **differentiated instruction**—instruction that is tailored to align with each student's current knowledge, skills, and needs.

Intelligence

Learning Objective 5.1 **Describe various perspectives on the nature of intelligence and identify several ways in which you can nurture intelligence in your own students.**

It is common for teachers, parents, and others to be involved in conversations about students' intelligence. However, there are a variety of ways to talk about intelligence—it's a complex topic. As we will discuss, measures of intelligence can be very useful, but overinterpretation of these scores can sometimes be harmful. Theorists define and conceptualize *intelligence* in a variety of ways, but most agree that it has several distinctive qualities:

- It is *adaptive:* It can be used flexibly to respond to a variety of situations and problems.
- It is related to *learning ability:* People who are intelligent in particular domains learn new information and skills in those domains more quickly and easily than people who are less intelligent in those domains.
- It involves the *use of prior knowledge* to analyze and understand new situations effectively.
- It involves the complex interaction and coordination of *many different mental processes.*
- It is *culture specific.* What is considered to be intelligent behavior in one culture isn't necessarily intelligent behavior in another culture. (Dai, 2010; Laboratory of Comparative Human Cognition, 1982; Li, 2004; Neisser et al., 1996; Saklofske et al., 2015; Sternberg, 1997, 2004, 2007; Sternberg & Detterman, 1986)

With these qualities in mind, we offer an intentionally broad definition of **intelligence**: the ability to apply prior knowledge and experiences flexibly to accomplish challenging new tasks.

For most educators, intelligence is somewhat different from what a person has actually learned (e.g., as reflected in school achievement). At the same time, intelligent thinking and behavior *depend* on prior learning. Intelligence, then, isn't necessarily a permanent, unchanging characteristic; it can be modified through experience and learning.

Theoretical Perspectives of Intelligence

Before we discuss some of the different perspectives on intelligence, let's take a moment to explore your own thinking about intelligence. Try the following activity:

Experiencing Firsthand

Generalizations About Intelligence

When you think about people that you know, you probably could describe them in many ways (e.g., how they look, what their personalities are like, etc.). One way that we often describe people is by their intelligence. For each person listed below, consider whether you have a sense of that person's overall intelligence (across all domains of their life). How would you describe that person's overall intelligence? Next, for each of the same people, can you think of a particular domain (e.g., math, writing, social skills) in which each individual has a particular strength?

- One or both of your parents or guardians
- Your favorite high school teacher
- Your least favorite high school teacher
- Your best friend
- Your current or last boss

Although we may not consciously think about how "smart" or "intelligent" various people are, when pushed, most people probably do have an opinion when it comes to people in our own lives. Did you have difficulty in responding to the prompts above? Were you able to describe these individuals' general, overall intelligence, and also to identify an area in which each individual is particularly talented? In most cases, you probably were able to do both.

If people can be described both in terms of their overall intelligence and in terms of unique areas of talent, then is one of these descriptors more meaningful than the other?

Table 5.1 Theories of Intelligence

Theory	Main Ideas
Spearman's "*g*"	A general form of overall intelligence that broadly indicates one's reasoning abilities.
Fluid Intelligence	Represents a person's ability to reason abstractly, acquire new knowledge, and adapt to new situations.
Crystallized Intelligence	Represents the knowledge and skills that people acquire from various aspects of their lives (e.g., culture, school, family, etc.).
Cattell-Horn-Carroll Theory of Cognitive Abilities	A conception of intelligence in which intelligence is represented by three distinct layers: (1) General intelligence (i.e., Spearman's "g"), (2) Specific abilities (including crystallized and fluid intelligence), and (3) Highly specific abilities.
Sternberg's Theory of Successful Intelligence	A conception of intelligence that acknowledges that intelligence is represented in people's everyday lives, and not just during academic pursuits. Intelligence consists of analytical intelligence, creative intelligence, and practical intelligence.
Gardner's Multiple Intelligences	Intelligence consists of at least eight distinct abilities (i.e., linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal, intrapersonal, and naturalist).

SOURCES: Ackerman & Lohman, 2006; Carroll, 1993, 2003; Cattell, 1963, 1987; D.P. Flanagan & Ortiz, 2001; Gardner, 1983, 1989; Horn, 2008; Spearman, 1904, 1927.

Does having "average" overall intelligence make a difference if someone is extraordinarily talented in specific areas (e.g., music, math, or sports)? These are the questions that researchers have asked for many years in trying to understand human intelligence.

Some researchers have suggested that intelligence is a single, general ability that people possess to varying degrees and apply in a wide range of activities. Others have disagreed, citing evidence that people can be more or less intelligent on different kinds of tasks, at different points in development, and in different contexts. There are quite a few distinct theories of intelligence. The theories, all of which are reviewed below, are summarized in Table 5.1.

General Intelligence When we think about people that we know, we may at times think about their overall intelligence, often comparing them to others. But is it appropriate to do so?

The theories of intelligence we examine in this section reflect these diverse perspectives.

Spearman's Concept of *g* When we think about people that we know, we may sometimes think about their overall intelligence, and as a teacher, this might be something that you are tempted to do with your students. Some research suggests that there may be, at least in an abstract way, an overall, general way to describe human intelligence. Imagine that you give a large group of students a wide variety of tests—some measuring verbal skills, others measuring visual–spatial thinking, and still others measuring mathematical problem solving. Chances are that the test scores would all correlate with one another to some degree: Students who score high on one test would tend to score high on the other tests as well. The correlations would be strong among tests of very similar abilities; those among tests of distinctly different abilities would be weaker. For example, a student who scored very high on a vocabulary test would probably score high on other measures of verbal ability but might have only modest success in solving math problems (McGrew et al., 1997; Neisser et al., 1996; Spearman, 1904).

Charles Spearman (1904, 1927) drew on such findings to propose that intelligence consists of both (1) a single reasoning ability (a *general factor*) that is used across the board and (2) a number of more specific abilities, such as problem-solving ability and abstract reasoning (*specific factors*). The general factor and any relevant specific factors work together as we engage with various tasks. Many researchers believe that sufficient evidence supports Spearman's concept of a general factor in intelligence—often known simply as Spearman's *g*. (Bornstein et al., 2006; Coyle et al., 2011; Haier, 2003). A general ability to control and direct one's thinking may also be involved (Cornoldi, 2010; Coyle et al., 2011; Haier, 2003; H. L. Swanson, 2008).

Cattell's Fluid and Crystallized Intelligences Several decades after Spearman's work, another framework emerged, describing two types of general intelligence (Catell, 1963, 1987). First, people differ in **fluid intelligence**, which refers to our ability to acquire knowledge quickly, use abstract reasoning abilities, and adapt to new situations effectively. Second, **crystallized intelligence** refers to the knowledge and skills that we accumulate from our experiences, schooling, and culture. Fluid intelligence is more important for new, unfamiliar tasks, especially those that require rapid decision-making and involve nonverbal content. Crystallized intelligence is more important for familiar tasks, especially those that depend heavily on language and prior knowledge.

One of these questions assesses fluid intelligence, whereas the other assesses crystallized intelligence. Can you tell which is which?

Experiencing Firsthand

Crystallized and Fluid Intelligence

Consider the following two questions (Roberts & Lipnevich, 2012):

1. What is the next number in this sequence: 1 2 1 4 1 6 1 8?
2. What is the meaning of the word *peripatetic*?

Question 1 assesses fluid intelligence—a student must reason abstractly to figure out the next number in the sequence; in contrast, question 2 represents crystallized intelligence, because knowledge of the meaning of the word *peripatetic* is something that a student would have learned—the answer could not be determined through any form of reasoning.[1] Both of these types of intelligence are important and valuable, but as you can see, they are also quite different.

Keep in mind that there are many different ways to think about intelligence.

Cattell–Horn–Carroll Theory of Cognitive Abilities Some theorists have built on Cattell's work to suggest that intelligence may contain layers, or *strata* (Ackerman & Lohman, 2006; Carroll, 1993, 2003; Flanagan & Ortiz, 2001; Horn, 2008). The *Cattell–Horn–Carroll theory of cognitive abilities* suggests that intelligence consists of three layers (or "strata"). The top stratum is general intelligence, or *g*. Underlying it in the middle stratum are 9 or 10 more specific abilities (including crystallized and fluid intelligence). Finally, underlying *these* abilities in the bottom stratum are more than 70 very specific abilities, such as reading speed. The Cattell–Horn–Carroll theory is the most researched and most widely accepted theory of intelligence among individuals who work with school-aged children and adolescents, and many of the IQ assessments currently in use are based on this theory (e.g., Evans et al., 2001; Kyllonen, 2015; Phelps et al., 2005; Proctor, 2012; Proctor et al., 2005).

Sternberg's Theory of Successful Intelligence This theory acknowledges the role of intelligence both in our academic pursuits and in our everyday lives. The theory focuses on how our skills and abilities in three distinct domains help us achieve our short-term and long-term goals (Sternberg, 2004, 2012; Sternberg et al., 2000, 2021). *Analytical intelligence* involves making sense of, analyzing, contrasting, and evaluating the kinds of information and problems often encountered by students in school and on intelligence tests. *Creative intelligence* involves imagination, invention, and synthesis of ideas within the context of new situations. *Practical intelligence* involves applying knowledge and skills effectively to manage and respond to everyday problems and social situations. Sternberg has also suggested a fourth domain of intelligence: wisdom. **Wisdom** involves the ability to use one's various skills for the good of oneself and others (Sternberg, 2015); Sternberg et al., 2021).

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[1] The next numbers in the sequence would be 1 and 10; *peripatetic* means roaming or traveling (when used as an adjective) and a person who roams or travels (when used as a noun).

Although research supporting the original three components is limited (Kaufman et al., 2013; Roberts & Lipnevich, 2012; Sternberg et al., 2014), there is some evidence that the three components can be measured and that they are related to important educational outcomes (Sternberg et al., 2014). Nevertheless, the theory reminds us that students' ability to behave intelligently may vary considerably depending on the cultural context, previously learned knowledge and skills, and the cognitive processes that a task involves.

Gardner's Multiple Intelligences Howard Gardner (1983, 1999, 2011; Gardner & Hatch, 1990) suggests that people have at least eight distinct abilities, or *multiple intelligences,* that are relatively independent of one another (see Table 5.2). In his view, there may also be a ninth (existential) intelligence dedicated to philosophical and spiritual issues (e.g., Who are we? Why do we die?). However, because the evidence for this type is weaker than that for the other intelligences (Gardner, 1999, 2000a, 2003), we have excluded it from the table.

Gardner presents some evidence to support the existence of these distinctly different intelligences. For instance, he describes people who are quite skilled in one area, perhaps in composing music, yet have seemingly average abilities in other areas. He also points out that people who suffer brain damage sometimes lose abilities that are restricted primarily to one intelligence; one person might show deficits primarily in language, whereas another might have difficulty with tasks that require spatial reasoning.

Among psychologists, reviews of Gardner's theory are mixed (Kaufman et al., 2013; Roberts & Lipnevich, 2012). Some theorists don't believe that Gardner's evidence is sufficiently compelling to support the notion of distinctly different abilities (Brody, 1992; Corno et al., 2002; Sternberg, 2003; Waterhouse, 2006). Others agree that people may

Table 5.2 Gardner's Multiple Intelligences

Type of Intelligence	Examples of Relevant Behaviors
Linguistic intelligence: Ability to use language effectively	• Making persuasive arguments • Writing poetry or contributing to a blog • Noticing subtle nuances in meanings of words
Logical–mathematical intelligence: Ability to reason logically, especially in mathematics and science	• Solving mathematical problems quickly • Generating mathematical proofs • Formulating and testing hypotheses about observed phenomena[a]
Spatial intelligence: Ability to notice details of what one sees and to imagine and manipulate visual objects in one's mind	• Creating mental images • Manipulating mental images • Drawing a visual likeness of an object • Seeing subtle differences among visually similar objects
Musical intelligence: Ability to create, comprehend, and appreciate music	• Playing a musical instrument • Composing a musical work • Identifying the underlying structure of music
Bodily–kinesthetic intelligence: Ability to use one's body skillfully	• Dancing • Playing basketball • Performing pantomime
Interpersonal intelligence: Ability to notice subtle aspects of other people's behaviors	• Reading other people's moods • Detecting other people's underlying intentions and desires • Using knowledge of others to influence their thoughts and behaviors
Intrapersonal intelligence: Awareness of one's own feelings, motives, and desires	• Identifying the motives guiding one's own behavior • Using self-knowledge to relate more effectively with others
Naturalist intelligence: Ability to recognize patterns in nature and differences among various life-forms and natural objects	• Identifying members of particular plant or animal species • Classifying natural forms (e.g., rocks, types of mountains) • Applying one's knowledge of nature in such activities as farming, landscaping, or animal training

[a] This example may remind you of Piaget's theory of cognitive development. Many of the stage-specific characteristics that Piaget described reflect logical–mathematical intelligence.

SOURCES: Gardner, 1983, 1999.

have a variety of relatively independent abilities but argue for different distinctions than those Gardner makes. Still others reject the idea that abilities in certain domains, such as in music or body movement, are really "intelligences" per se (Bracken et al., 1999; Sattler, 2001).

Despite researchers' lukewarm reception of Gardner's theory, many educators have wholeheartedly embraced it because of its optimistic view of human potential and its focus on the unique talents that all of our students bring to the classroom. Gardner's perspective encourages us to use many different teaching methods so that we can capitalize on students' diverse talents to help them learn and understand classroom subject matter (Campbell et al., 1998; Gardner, 2000b; Kornhaber et al., 2004).

Present subject matter using a variety of approaches to capitalize on students' diverse abilities, but also give them tasks that require them to work on areas of weakness.

Regardless of whether our students have eight or more distinctly different intelligences, they certainly benefit when they're encouraged to think about a particular topic in two or more different ways—perhaps using both words and mental images (Mayer, 2011a; Moreno, 2006). We won't always want to teach to students' strengths, however; we must also give students tasks that encourage them to address and thereby strengthen their areas of weakness (Sternberg, 2002).

Chapter 2 describes Piaget's and Vygotsky's theories of development.

Developmental Views of Intelligence Theories of cognitive development portray children as becoming increasingly intelligent over time. Yet, with the possible exception of Sternberg's triarchic theory—which points out the importance of prior experiences—the perspectives of intelligence described so far don't really consider how intelligence might take different forms at different points in development (Dai, 2010).

Some researchers who study giftedness suggest that not only is intelligence somewhat specific to particular domains but also its basic nature changes with age and experience. From this perspective, the developmental course of exceptional abilities and talents is as follows:

1. Initially (typically in childhood), people show exceptional *potential* in a certain domain, perhaps in reading, math, or music.
2. With appropriate instruction, guidance, and practice opportunities, people show exceptional *achievement* in the domain.
3. If people continue to engage in domain-specific tasks over a lengthy time period (typically into adulthood), they may eventually gain considerable *expertise and eminence*, to the point that their accomplishments are widely recognized (Dai, 2010; Subotnik et al., 2011).

In addition, increases in more general cognitive abilities are related to experiences such as school attendance, work experiences, and other life events (Kyllonen, 2015). Here, then, we see a very dynamic view of intelligence: Although its roots may be in certain natural endowments, over the long run intelligence requires both environmental nurturance and personal perseverance (Dai, 2010; Subotnik et al., 2011).

Distributed Intelligence Many educators realize that not only does a supportive environmental context enhance people's intelligence over time but in fact it can facilitate intelligent behavior in the here and now. People are far more likely to think and behave intelligently when they have assistance from their physical, cultural, and social environments—an idea that is sometimes called **distributed intelligence** (e.g., Hutchins, 1995; Pea, 1993; Perkins, 1995). People can "distribute" a challenging task—that is, they can pass some of the cognitive burden on to something or someone else—in at least three ways. First, they can use physical objects, especially technology (e.g., tablets, calculators, computers), to handle and manipulate information. In particular, having a smartphone available virtually at any time affords students the opportunity to access information and various tools. Second, they can represent and think about the situations they encounter by using their culture's various symbolic systems—such as words, charts, and diagrams. Third, they can work with other people to explore ideas and solve problems—as we've often heard, two heads are (usually) better than one. In fact, when students work together on complex, challenging tasks and problems, they teach one another strategies and ways of thinking that can help each of them think even *more* intelligently on future occasions (Kuhn, 2001b; Palincsar & Herrenkohl, 1999; Slavin, 2011).

From a distributed intelligence perspective, then, intelligence is a highly variable, context-specific ability that increases when appropriate environmental supports are available. It certainly isn't an immutable trait that learners "carry around" with them, nor is it something that can be easily measured and then summarized with one or more test scores. However, psychologists coming from other theoretical perspectives often *do* try to measure intelligence, as we'll see now.

Identify physical, symbolic, and social supports that can help students think more intelligently.

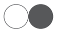
Measuring Intelligence

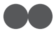
When a student consistently struggles with certain aspects of the curriculum, as Tim does in the opening case study, psychologists sometimes find it helpful to get a measure of the student's general level of cognitive functioning. Such measures are commonly known as **intelligence tests**. To get a sense of what intelligence tests are like, try the following exercise.

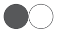
Experiencing Firsthand

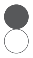
Mock Intelligence Test

Answer each of these questions:

1. What does the word *penitence* mean?
2. How are a goat and a beetle alike?
3. What should you do if you get separated from your family in a large department store?
4. What do people mean when they say, "A rolling stone gathers no moss"?
5. Complete the following analogy: is to as  is to:

a. 

b. 

c. 

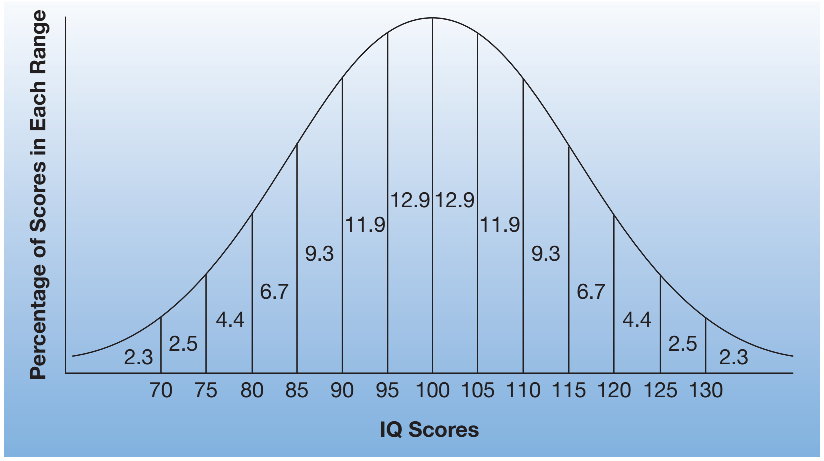
d.

These test items are modeled after items on many contemporary intelligence tests. Often the tests include a mixture of verbal tasks (such as items 1 through 4) and less verbal, more visual tasks (such as item 5).

Scores on intelligence tests were originally calculated using a formula that involves division. Hence, they were called *intelligence quotient scores*, or **IQ scores**. Although we still use the term *IQ*, intelligence test scores are no longer based on the old formula. Instead, they're determined by comparing a student's performance on a given test with the performance of others in the same age-group. This is a very important point—an IQ score is reflective of a student's cognitive abilities at a particular age, compared to students of the same age. A score of 100 indicates average performance on the test: Students with this score have performed better than half of their age-mates but not as well as the other half. Scores well below 100 indicate below-average performance on the test; scores well above 100 indicate above-average performance.

Figure 5.1 shows the percentages of students getting scores at different points along the scale (e.g., 12.9% get scores between 100 and 105). Notice that the curve is high in the middle and low at both ends, indicating that scores close to 100 are far more common than scores considerably higher or lower than 100. For example, if we add up the percentages in different parts of Figure 5.1, we find that approximately two-thirds (68%) of students score within 15 points of 100 (i.e., between 85 and 115). In contrast, only 2% of students score as low as 70, and only 2% score as high as 130. Such a many-in-the-middle-and-few-at-the-extremes distribution of scores seems to

Figure 5.1 Percentages of IQ scores in different ranges.



If you have taken a course in descriptive statistics, you may realize that IQ scores are *standard scores* based on the *normal distribution*. Chapter 15 explains these concepts.

characterize a wide variety of human characteristics. Hence, psychologists have created a method of scoring intelligence test performance that intentionally yields this same distribution.

In the opening case study, Tim's performance on an intelligence test yields an IQ score of 96, which we can now understand. As you can see in Figure 5.1, a score of 96 is so close to 100 that we should consider it to be well within the average range. Researchers are still studying intelligence and designing new assessments of intelligence; for example, some researchers are now developing neuropsychological assessments (e.g., Gansler et al., 2017). It has become particularly apparent in recent years that other noncognitive variables (e.g., motivation and persistence) are related to intelligence. In addition, new techniques are being developed to account for the fact that some individuals work quickly through assessments (and thus may complete more of the assessment, but may commit more errors because of going quickly), whereas other test takers are slower and more deliberate, and may achieve greater levels of accuracy, but not complete as many items (van der Linden, 2007).

IQ Scores and School Achievement Studies repeatedly show that performance on intelligence tests is correlated with school achievement. On average, children with higher IQ scores earn higher course grades, do better on standardized achievement tests, and complete more years of education (Brody, 1997; Duckworth et al., 2012; Sattler, 2001). However, the relationship between IQ scores and achievement is related to many other factors as well. For example, some research suggests that students' self-perceptions of ability at times are better predictors of achievement than actual intelligence test scores (Lauermann et al., 2020).

It's important to keep three points in mind about this IQ–achievement relationship. First, intelligence doesn't necessarily *cause* achievement; it is simply correlated with it. Even though students with high IQs typically perform well in school, we cannot conclusively say that their high achievement is actually the result of their intelligence. Intelligence probably does play an important role in school achievement, but so, too, do many other factors: motivation, quality of instruction, family and neighborhood resources, peer-group expectations, and so on. Second, the relationship between IQ scores and achievement is an imperfect one. For a variety of reasons, some students with high IQ scores don't perform well in the classroom, and others achieve at higher levels than we would predict from their IQ scores alone. For example, some research suggests that the relation between intelligence and achievement is affected by sleep—when students do not get enough sleep on any given night, intelligence and achievement aren't as closely correlated as they might be otherwise (Erath et al., 2015). Third and most important, we must remember that an IQ score simply reflects a child's performance on a particular test at a particular time—it's *not* a permanent characteristic etched in stone—and that some change is to be expected over time.

Nature and Nurture in the Development of Intelligence

Research tells us that heredity probably plays some role in intelligence. For instance, identical twins tend to have more similar IQ scores than nonidentical (fraternal) twins do, even when the twins are adopted at birth by different parents and grow up in different homes. This is *not* to say, however, that children inherit a single IQ gene that determines their intellectual ability; rather, they probably inherit a variety of characteristics that affect particular cognitive abilities and talents (Davis et al., 2009; Horn, 2008; Kan et al., 2013; Kovas & Plomin, 2007; Plomin & Deary, 2015).

Both heredity and environmental influences affect intelligence.

Environmental factors influence intelligence as well, sometimes for the better and sometimes for the worse. Poor nutrition in the early years of development (including the nine months before birth) leads to lower IQ scores, as does a mother's excessive use of alcohol during pregnancy (Neisser et al., 1996; Ricciuti, 1993; Sigman & Whaley, 1998; Sniekers et al., 2017). Moving a child from a neglectful, impoverished environment to a more nurturing, stimulating one (e.g., through adoption) can result in IQ gains of 15 points or more (Beckett et al., 2006; Capron & Duyme, 1989; van IJzendoorn & Juffer, 2005). Effective, too, are long-term intervention programs designed to help children acquire basic cognitive and academic skills (e.g., Campbell & Burchinal, 2008; Kağitçibaşi, 2007). Some evidence suggests that the acquisition of reading skills during childhood is related to increases in intelligence (Ritchie et al., 2015a). Even simply *going to school* has a positive effect on IQ scores (Ceci, 2003; Ramey, 1992), although the effects are strongest for specific aspects of intelligence as opposed to general intelligence ("*g*"; Ritchie et al., 2015b). Attending an academically rigorous school, in particular, may be related to gains in intelligence, even during adolescence (Becker et al., 2012). Performance on intelligence tests increased during the 20th century and has declined somewhat in recent years. Research suggests that these shifts are unrelated to genetics and to characteristics of one's family (e.g., family size, parent education) (Bratsberg & Rogeberg, 2018; Flynn, 2007; Neisser, 1998).

The question of how *much* nature and nurture each play a role in influencing intelligence has been a source of controversy; but in fact, genetic and environmental factors interact in their influences on cognitive development and intelligence in ways that can probably never be disentangled. Genes also indirectly affect intelligence because our genetic makeup may cause us to experience different environmental influences; it is those environmental influences that may have the most profound effects on intelligence (Lynch, 2017). Genes require reasonable environmental support to do their work. In an extremely impoverished environment—one with a lack of adequate nutrition and stimulation—heredity may have little to do with children's intellectual growth, but under better circumstances it can have a significant influence (Ceci, 2003; Rowe et al., 1999; Turkheimer et al., 2003). Heredity also seems to affect how susceptible or impervious a child is to particular environmental conditions (Rutter, 1997). For instance, some students—such as those with certain inherited disabilities—may need a quiet, well-structured learning environment in which to acquire effective reading comprehension skills, but other students might pick up good reading skills regardless of the quality of their environment. Third, children tend to seek out environmental conditions that match their inherited abilities (Davis et al., 2009; Johnson, 2010; Scarr & McCartney, 1983). Children who inherit exceptional quantitative reasoning ability may enroll in advanced math courses and in other ways nurture their inherited talent. Children with average quantitative ability are less likely to take on such challenges and thus have fewer opportunities to develop their mathematical skills.

Intelligence and the Brain Intelligence—at least that aspect of intelligence that can be measured by IQ tests—does seem to have some basis in the brain (Goriounova & Mansvelder, 2019; Karama et al., 2011). A high level of intelligence also seems to involve ongoing, efficient interactions among numerous brain regions (Jung & Haier, 2007). Research conducted by neuroscientists suggests that numerous components of intelligence are related to the brain and its development, including basic cognitive skills in young children, memory, attention, reading, and mathematics ability (Byrnes, 2012). Although heredity appears to play some role in these differences, the extent to which they are the result of nature, nurture, or a nature–nurture interaction remains to be seen (Jung & Haier, 2007). In any case, we must remember that the human brain has considerable ability to restructure itself—that is, it has *plasticity*—throughout childhood and adulthood.

See Chapter 2 for more information on the structure, development, and plasticity of the human brain.

Cultural and Ethnic Diversity in Intelligence

Historically, some ethnic groups in the United States have, *on average*, performed better on intelligence tests than other ethnic groups have. Most experts agree that such group differences in IQ scores are due to differences in environment and, more specifically, to economic circumstances that affect the quality of prenatal and postnatal nutrition, availability of stimulating books and toys, access to educational opportunities, and so on (Brooks-Gunn et al., 1996; Byrnes, 2003; McLoyd, 1998). Furthermore, various groups have become increasingly *similar* in average IQ score in recent years—a trend that can be attributed only to more equitable environmental conditions (Dickens & Flynn, 2006; Neisser et al., 1996).

Assume that when children from diverse ethnic groups all have reasonably stimulating environments, they have equal potential to develop their intellectual abilities.

Yet it's important to note that different cultural groups have somewhat different views about what intelligence *is* and may therefore nurture somewhat different abilities in their children (Saklofske et al., 2015). Many people of European descent think of intelligence primarily as an ability that influences children's academic achievement and adults' professional success. In contrast, people in many other cultures think of intelligence as involving social as well as academic skills, such as maintaining harmonious interpersonal relationships and working effectively together to accomplish challenging tasks (Greenfield et al., 2006; Li & Fischer, 2004; Sternberg, 2004, 2007). In Buddhist and Confucian societies in the Far East (e.g., China, Taiwan), intelligence also involves acquiring strong moral values and making meaningful contributions to society (Li, 2004; Sternberg, 2003).

Cultural groups differ, too, in the behaviors that they believe reflect intelligence. For example, many traditional measures of intelligence take speed into account on certain test items: Children score higher if they respond quickly as well as correctly. Yet people in some cultures tend to value thoroughness over speed and may be skeptical when tasks are completed very quickly (Sternberg, 2007). As another example, many people in mainstream Western culture interpret strong verbal skills as a sign of intelligence, but for many Japanese and many Inuit people of northern Quebec, talking a lot indicates immaturity or low intelligence (Minami & McCabe, 1996; Sternberg, 2003). One Inuit teacher had this concern about a boy whose language was quite advanced for his age group:

> Do you think he might have a learning problem? Some of these children who don't have such high intelligence have trouble stopping themselves. They don't know when to stop talking. (Crago, 1988, p. 219)

As teachers, then, we must be careful not to assume that our own views of intelligence are shared by the students and families of cultures very different from our own.

When meeting with students' parents, remember that those from diverse backgrounds may value different aspects of intelligence.

Being Smart About Intelligence and IQ Scores

As a teacher, you will have access to a great deal of information about your students. You may have access to their grades from prior years, their attendance records, behavioral infractions, family background, special education status, achievement test scores, intelligence scores, and many other data points. Is any one of these more important than another? Do you as a teacher need or want access to all of this information? We need to keep in mind that intelligence scores are simply one piece of information. If you do have access to a student's score on an intelligence test, keep the following in mind:

- *Place higher priority on developing—rather than on determining—intelligence.* As we've seen, intelligence is hardly a fixed, unchangeable characteristic: Environmental factors, including schooling, can lead to increases in children's measured intelligence. The notion of distributed intelligence suggests that virtually all students can act more intelligently when they have tools, symbolic systems, and social groups to assist them. As teachers, we should think more about *enhancing and supporting* students' intelligence than about measuring it (Dai, 2010; Nichols & Mittelholtz, 1997; Posner & Rothbart, 2007; Rhodes, 2008).
- *Think of intelligence tests as useful but imperfect measures.* Intelligence tests aren't magical instruments that mysteriously determine a learner's true intelligence—if, in fact, such a thing as "true" intelligence exists. These tests are simply collections of questions and tasks that psychologists have developed to get a handle on how well students can think, reason, and learn at a particular point in time. Used in conjunction with other information, they can often give us a general idea of a student's current cognitive functioning. To interpret IQ scores appropriately, however, we must be aware of their limitations:
    - Different kinds of tests can yield different scores.
    - A student's performance on any test will inevitably be affected by many temporary factors, including general health, time of day, and distracting circumstances. Such factors are especially influential for young children, who are apt to have high energy levels, short attention spans, and little interest in sitting still for more than a few minutes.
    - Test items typically focus on certain skills that are important in mainstream Western culture—especially in school settings—and on tasks that can be accomplished within a single, short testing session. They don't necessarily tap into skills that are more highly valued and nurtured in other cultures, nor do they tap into skills that involve lengthy time periods (e.g., planning ahead, making wise decisions) or highly specific areas.
    - Some students may be unfamiliar with the content or types of tasks involved in particular test items and may perform poorly on those items as a result.
    - Measures of intelligence are not always the best predictors of a student's long-term success. In fact, research indicates that grades and scores on specific achievement tests are more accurate predictors of long-term life outcomes than are intelligence test scores (Borghans et al., 2016).
    - English language learners—students who have only limited proficiency in English as a result of growing up in a non-English-speaking environment—are at an obvious disadvantage when an intelligence test is administered in English. Thus, their IQ scores will typically be poor indicators of what they will be able to do once their English improves (Olvera & Gómez-Cerrillo, 2014; Perkins, 1995; Stanovich, 2009; Sternberg, 2007; Sternberg et al., 2005).

Young children's distractibility during a testing session decreases the *reliability* of any test scores obtained (see Chapter 14 and Chapter 15).

Be skeptical of any IQ scores obtained for recent immigrants and other students who were not fluent in English when tested. In general, never base expectations for students' achievement *solely* on IQ scores.

Obviously, then, we must be skeptical of IQ scores obtained for students who come from diverse cultural backgrounds, know little English, or were fairly young at the time of assessment.

- *Use the results of more focused measures when you want to assess specific abilities.* Whenever we obtain and use IQ scores, we're buying into the idea that a general factor, or *g*, underlies academic performance. But given the multifaceted nature of intelligence, no single test can possibly give us a complete picture of a student's abilities. If we want to estimate a student's potential for success in a particular domain—say, in mathematics—we're probably better off using measures of more specific abilities (Ackerman & Lohman, 2006; Horn, 2008; McGrew et al., 1997). However, we urge you to rely *only* on instruments available from well-respected test publishers. Tests you might find on the Internet—for instance, tests that claim to measure Gardner's multiple intelligences—have typically undergone little or no research scrutiny, making their results questionable at best. Keep in mind, too, that intelligence tests should be administered only by school psychologists and other professionals who have been specifically trained in their use.

Don't use so-called "intelligence tests" you find posted on the Internet.

- *Look for behaviors that reveal exceptional talents within the context of a student's culture.* For example, among students who have grown up in predominantly African American communities, intelligence might be reflected in oral language, such as colorful speech, creative storytelling, or humor. For students from Native American cultures, intelligence might be reflected in interpersonal skills, highly skilled craftsmanship, or an exceptional ability to notice and remember subtle landmarks in one's physical environment (Dai, 2010; Sternberg, 2005; Torrance, 1989).

  As teachers we must be careful not to limit our conception of intelligence only to students' ability to succeed at traditional academic tasks and to perform well on traditional intelligence tests. One alternative is *dynamic assessment:* Rather than assess what students already know and can do, we might teach them something new and see how quickly and easily they master it (Feuerstein et al., 2010; Haywood & Lidz, 2007; Sternberg, 2007).

Chapter 14 provides more details about dynamic assessment.

- *Remember that many other factors also affect students' classroom achievement.* Most measures of intelligence focus on specific tasks that a student *can* do, with little consideration of what a student is *likely* to do. For instance, intelligence tests don't evaluate the extent to which students are willing to view a situation from multiple perspectives, examine data with a critical eye, try hard even when faced with a difficult question, or take charge of their own learning. Yet such traits are often just as important as intellectual ability in determining success on academic and real-world tasks (Duckworth & Seligman, 2005; Kuhn, 2001a; Perkins et al., 2000). Although some research suggests that teachers' expectations for students can have small effects on students' intelligence test scores (Raudenbush, 1984), those findings are inconclusive (Jussim & Harber, 2005). In the next section, we'll examine forms that these *cognitive styles* and *dispositions* might take.

Chapter 11 discusses the relations between teacher expectations and student achievement.

Cognitive Styles and Dispositions

Learning Objective 5.2 Explain how students' cognitive styles and dispositions might influence their classroom performance.

Students with the same general level of intelligence often approach classroom tasks and think about classroom topics differently. Some of these individual differences reflect **cognitive styles**, over which students don't necessarily have much conscious control. Others reflect **dispositions**, which students voluntarily and intentionally bring to bear on their efforts to master subject matter. Don't agonize over the distinction between the two concepts, because their meanings overlap considerably. Both involve not only specific cognitive tendencies but also personality characteristics (Furnham, 2012; Messick, 1994; Zhang & Sternberg, 2006). Dispositions also have a motivational component—an I-*want*-to-do-it-this-way quality (Kuhn, 2001a; Perkins & Ritchhart, 2004; Stanovich, 1999).

There's No Such Thing as Learning Styles

Over the past few decades, psychologists and educators have examined a wide variety of cognitive styles, sometimes using the term *learning styles.* You probably have heard of educators discussing students as perhaps being "visual learners" or "auditory learners." The notion behind learning styles is that if teachers adjust instruction to meet the preferred learning styles of individual students, then learning will be enhanced. Thus, if a "visual learner" is provided with extra visual materials when learning about a new topic, that student's learning will be improved.

Despite the popularity of this idea among educators, there is virtually no evidence that adapting instruction to students' learning styles has any effect on their actual learning (Curry, 1990; Mayer & Massa, 2003; Nieto & Bode, 2008; Rogowsky et al., 2015; Roher & Pashler, 2012; Snider, 1990). Many of the styles that have been identified and assessment instruments that have been developed don't hold up under the scrutiny of researchers (Cassidy, 2004; Krätzig & Arbuthnott, 2006; Messick, 1994). Learning "styles" are basically just preferences; some students may indicate that they prefer to learn through listening, whereas others may indicate that they prefer to learn visually. Nevertheless, these preferences are just that—preferences. It is not the case that students with one preferred style cannot learn just as well when information is presented in other ways. Surprisingly, research suggests that some individuals who strongly believe in the validity of learning styles also believe that students will learn most effectively when they use multimodal learning strategies—two seemingly contradictory beliefs (Nancekivell et al., 2021).

There is no research that shows that designing instruction to match a child's preferred learning style will improve their academic achievement.

In fact, adapting instruction to students' preferred learning styles, or even telling students that they may have a learning style, may prove to be detrimental to learning. Consider the following example:

> Harper is a sixth grader who does very well in school. On her mid-year report card, Harper's science teacher noted, "Harper does a great job in class; I just wish that she would participate more in our discussions." When Harper's parents asked her why she did not participate more in class, she responded that "the guidance counselor came in and gave us a test on our learning styles; she told me that I'm a visual learner. Since I am a visual learner, I don't really need to talk to learn; I just watch."

Why is this situation troubling? First, as we noted before, assessments of learning styles are generally not scientifically verified (and these "styles" are really just preferences). Second, and more disturbing, Harper has interpreted the information about being a visual learner as suggesting that she does not need to learn with other modalities. If Harper is a quiet student, then we might recommend greater verbal interaction so that she can further develop her verbal skills; however, her naïve interpretation of the information about her visual learning style may actually cause her to talk even less!

Does It Make Sense to Teach to Students' "Right Brains" or "Left Brains"?

As a teacher, you will probably hear about lessons, materials, and curricula that have been developed based on the latest findings from neuroscience; sometimes this is referred to as *brain-based learning* or *brain-based education*. Neuroscience is a growing area of research with exciting new discoveries emerging all the time; however, most researchers agree that it is too early to apply this research to daily classroom instruction.

Don't plan instruction based on results you might get from easily available and aggressively marketed "learning style" inventories or "brain-based curricula."

One area that has received much attention is the notion of adapting instruction to the "left brain" or the "right brain." Neuroscientists, in fact, have completely debunked the idea that we might teach to students' "left brains" or "right brains": Even the simplest of everyday thinking tasks requires the left and right hemispheres of the brain to work together (Bressler, 2002; Gonsalves & Cohen, 2010; Haxby et al., 2001; Kalbfleisch & Gillmarten, 2013; Organization for Economic Cooperation and Development, 2015).

Analytic and Holistic Thinking

One dimension of cognitive style worthy of our attention, however, is a distinction between analytic and holistic thinking (Cheon et al., 2018). In *analytic* thinking, learners tend to break new stimuli and tasks into their component parts and to see these parts somewhat independently of their context. In *holistic* thinking, learners tend to perceive situations as integrated, indivisible wholes that are closely tied to their context. Researchers have found cultural differences here: People from mainstream Western culture tend to be analytic thinkers, whereas people from East Asian cultures think more holistically (Park & Huang, 2010; Varnum et al., 2010). In general, logical and scientific reasoning requires analytic thinking, but holistic thinking can help learners identify associations and relationships among seemingly very different phenomena. For example, holistically minded Chinese scientists identified the underlying cause of the ocean's tides—the moon's gravitational pull on any large body of water—many centuries before more narrowly focused, Earth-centered European scientists did (Nisbett, 2009).

Dispositions

In contrast to the lack of research support regarding cognitive styles and learning styles, research on dispositions has yielded more consistent and fruitful results. Some kinds of dispositions are clearly beneficial for classroom learning:

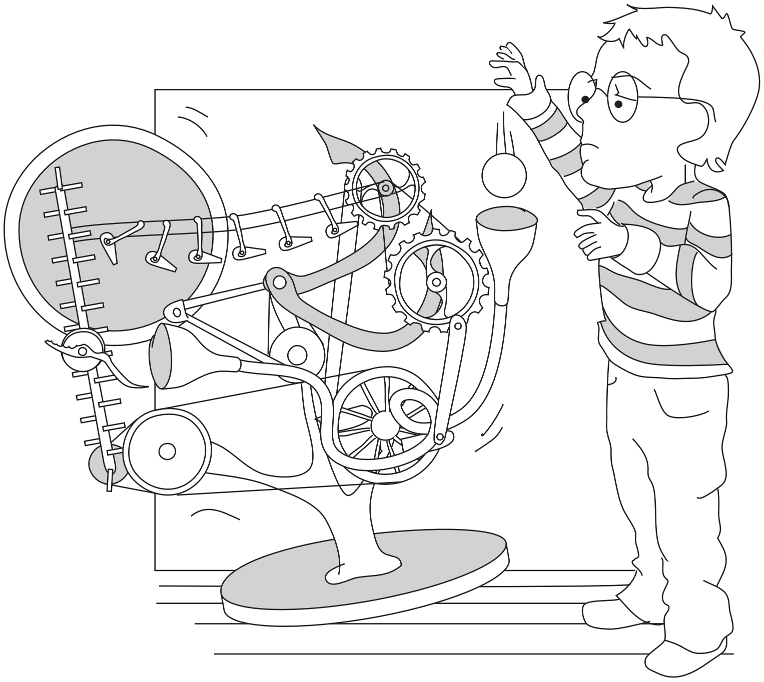
- *Stimulation seeking:* Eagerly interacting with one's physical and social environment to gain new experiences and information
- *Need for cognition:* Regularly seeking and engaging in challenging cognitive tasks
- *Critical thinking:* Consistently evaluating information or arguments in terms of their accuracy, credibility, and worth, rather than accepting them at face value
- *Open-mindedness:* Flexibly considering alternative perspectives and multiple sources of evidence, and suspending judgment for a time rather than leaping to immediate conclusions (Cacioppo et al., 1996; DeBacker & Crowson, 2008, 2009; Furnham, 2012; Halpern, 2008; Kang et al., 2009; Raine et al., 2002; Southerland & Sinatra, 2003; Stanovich, 1999; West et al., 2008)

Chapter 8 describes critical thinking more thoroughly.

Such dispositions are often positively correlated with students' learning and achievement, and many theorists have suggested that they play a causal role in what and how much students learn. In fact, dispositions sometimes overrule intelligence in their influence on long-term achievement (Dai & Sternberg, 2004; Kuhn & Franklin, 2006; Perkins & Ritchhart, 2004). For instance, children who eagerly seek out physical and social stimulation as preschoolers later become better readers and earn better grades in school (Raine et al., 2002). Students with a high need for cognition learn more from what they read and are more likely to base conclusions on sound evidence and logical reasoning (Cacioppo et al., 1996; Dai, 2002; Murphy & Mason, 2006). And students who critically evaluate new evidence and open-mindedly listen to diverse perspectives show more advanced reasoning capabilities and are more likely to revise their beliefs in the face of contradictory information (DeBacker & Crowson, 2009; Matthews et al., 2006; Southerland & Sinatra, 2003). We also need to acknowledge, however, that these dispositions do not guarantee high achievement. For example, students who seek a great deal of stimulation may also be tempted to engage in behaviorally inappropriate or risky activities that may distract them from academic pursuits (Lauriola et al., 2014).

Researchers haven't yet systematically addressed the origins of various dispositions. Perhaps inherited temperamental differences (e.g., in stimulation seeking) are involved (Raine et al., 2002). Beliefs about the underlying nature of knowledge—for instance, the belief that knowledge is fixed and unchanging, on the one hand, or dynamic and continually evolving, on the other—may also play a role (King & Kitchener, 2002; Kuhn, 2001b; Mason, 2003). And almost certainly teachers' actions and the classroom

Beliefs about the underlying nature of knowledge are known as epistemic beliefs (see Chapter 8).



Children differ in their desires for intellectual stimulation and challenging cognitive tasks.

atmosphere they create—for example, whether students are encouraged to pursue intriguing topics, take academic risks, and think critically—make a difference (Flum & Kaplan, 2006; Gresalfi, 2009; Kuhn, 2001b, 2006). In the following classroom interaction, a teacher actually seems to *discourage* any disposition to think analytically and critically about classroom material:

> Write this on your paper . . . it's simply memorizing this pattern. We have meters, centimeters, and millimeters. Let's say . . . write millimeters, centimeters, and meters. We want to make sure that our metric measurement is the same. If I gave you this decimal, let's say .234 m (yes, write that). In order to come up with .234 m in centimeters, the only thing that is necessary is that you move the decimal. How do we move the decimal? You move it to the right two places. . . . Simple stuff. (Turner et al., 1998, p. 741)

Undoubtedly, this teacher means well, but notice the noncritical attitude she communicates: "Write this . . .

Into The Classroom

Promoting Productive Dispositions

- **Communicate your own eagerness to learn about and master new topics.**

  In a unit on poetry, a middle school English teacher says, "In our culture, we're accustomed to poems that rhyme and have a steady beat. But many centuries ago, the Japanese developed a very different form of poetry. This form, called *haiku*, is really cool. I'll give you some of my favorite examples, and then as a class we'll create some new haiku."

- **Model open-mindedness about diverse viewpoints and a willingness to suspend judgment until all the facts are in.**

  In a lesson about the properties of air—especially the fact that it takes up space—a first-grade teacher asks her students to predict whether the inside of a glass will get wet or stay dry when it is pushed upside down into a bowl of water. After the glass has been immersed, students come to different conclusions about the wetness or dryness of its inside. The teacher responds, "Uh-oh. Now we have two different opinions. We are going to have to figure out how to solve this problem." She devises a simple strategy—stuffing a crumpled paper towel into the glass and then re-immersing it in the water—to get more conclusive evidence.

- **Conduct learning activities in which students collaborate to address intriguing, multifaceted issues.**

  A few weeks before a national presidential election, a high school social studies teacher says to his class, "Many of the campaign ads we see on television now are harshly criticizing opposing candidates, and some of them may be misrepresenting the facts. In your cooperative groups today, you'll be looking at transcripts of three political ads, one each from a different candidate's campaign. Each group has at least two laptops or tablets with wi-fi. Your job is to be fact checkers—to search the Internet for credible websites that can either confirm or contradict what the candidates are saying about their own records or those of their opponents. Tomorrow we'll compare the findings of various groups."

- **Ask students to evaluate the quality of scientific evidence and scaffold their efforts sufficiently so that they can reach appropriate conclusions.**

  Working in pairs, fifth graders conduct "experiments" in a computer program that simulates the effects of various factors (amount of rainfall, rate of snowmelt, type of soil, etc.) on local flooding. To guide students' inquiry, the program asks them to form and then test specific hypotheses, and it occasionally asks them if a particular series of tests has controlled for other potentially influential factors.

SOURCES: Strategies based on discussions by de Jong, 2011; Gresalfi, 2009; Halpern, 1998; Kuhn, 2001b; Perkins & Ritchhart, 2004; vanSledright & Limón, 2006.

it's simply memorizing this pattern." The Into the Classroom feature "Promoting Productive Dispositions" offers strategies that are more likely to be effective.

Educating Students with Special Needs in General Education Classrooms

Learning Objective 5.3 Identify implications of the U.S. Individuals with Disabilities Education Act (IDEA) for your own work as a teacher.

As a teacher, you will most certainly have students with various special needs in your classroom. Teachers can typically accommodate many students' varying abilities and dispositions within the context of a single curriculum and everyday classroom lessons. But we're also likely to have **students with special needs**—students who are different enough from their peers that they require specially adapted instructional materials and practices to help them maximize their learning and achievement. Some of these students have cognitive, personal, social, or physical disabilities that adversely affect their performance in a typical classroom. Furthermore, the prevalence of many developmental disabilities has increased in recent years (Zablotsky et al., 2019). Others, instead, are so advanced in a particular domain—that is, they are *gifted*—that they gain little from grade-level activities and assignments.

In the United States, most students with special educational needs receive instruction in general education classrooms for part or all of the school day—a practice known as **inclusion** (U.S. Department of Education, National Center for Education Statistics, 2010). In fact, federal legislation mandates that students with disabilities be educated in neighborhood schools and, ideally, in regular classrooms to the greatest extent possible.

Public Law 94-142: Individuals with Disabilities Education Act (IDEA)

In 1975, the U.S. Congress passed Public Law 94-142, which is now known as the **Individuals with Disabilities Education Act (IDEA)**. This act has been amended and reauthorized several times since then, most recently in 2004 under the name *Individuals with Disabilities Education Improvement Act.* It currently grants educational rights from birth until age 21 for people with cognitive, emotional, or physical disabilities. It guarantees several rights for students with disabilities:

- *A free and appropriate education.* All students with disabilities are entitled to a free educational program designed specifically to meet their unique educational needs.
- *Fair and nondiscriminatory evaluation.* A multidisciplinary team conducts an in-depth evaluation of any student who may be eligible for special services. The team's makeup depends on the student's needs, but typically consists of two or more teachers, any appropriate specialists, and the student's parent(s) or guardian(s). Using a variety of tests and other evaluation tools, school personnel conduct a complete assessment of potential disabling conditions. Evaluation procedures must take a student's background and any suspected physical or communication difficulties into account. For example, tests must be administered in a student's primary language.
- *Education in the least restrictive environment.* To the greatest extent possible, students with disabilities should be included in the same academic environment, extracurricular activities, and social interactions as their peers without disabilities. That is, they must have the **least restrictive environment**, the most typical and standard educational environment that, with sufficient supplementary aids and support services, can reasonably meet their needs. Exclusion from general education is warranted only when others' safety would be jeopardized or when, even with proper support and assistance, a student can't make appreciable progress in a general education setting.

Figure 5.2 Components of an individualized education program (IEP).

In the United States, any IEP written for a student with a disability must include the following information:

- *Current performance:* Information about the student's current school achievement levels, including classroom tests and assignments, teachers' and specialists' observations, and results of individually administered assessments.
- *Annual goals:* Objectives or benchmarks for the school year related to the student's academic, social, behavioral, and/or physical needs.
- *Special education and related services:* The special services, supplementary aids, and program modifications that will be provided in order to help the student meet the annual goals.
- *Participation with nondisabled children:* If applicable, explanation of the extent to which the student will *not* participate in regular classroom and extracurricular activities.
- *Measurement of progress:* Information regarding how the student's progress will be monitored and how parents will be informed of this progress.
- *Participation in state and district-wide tests:* Explanation of any modifications or exclusions with respect to regularly administered achievement tests and, if applicable, description of any alternative measures of achievement.
- *Dates and places:* Information regarding when and where services will begin and how long they will continue.
- *Transition services:* For any student aged 14 (or younger, if appropriate), any special services needed for reaching post-school goals and preparing to leave school.

SOURCE: U.S. Department of Education, Office of Special Education and Rehabilitative Services, 2000.

Provide as typical an educational experience as possible for *all* of your students.

- *Individualized education program (IEP).* When an individual age 3 to 21 is identified as having a disability, the multidisciplinary team collaboratively develops an instructional program, called an **individualized education program (IEP)**, tailored to the individual's strengths and weaknesses (see Figure 5.2). The IEP is a written statement that the team continues to review and, if appropriate, revise at least once a year—more frequently if conditions warrant. IEP meetings are most effective when they (a) are well planned; (b) have a designated meeting facilitator, a clear agenda, and ground rules for how to run the meeting; and when participants (c) have sufficient knowledge about these meetings and avoid using jargon (Diliberto & Brewer, 2014).
- *Due process.* IDEA mandates several practices that ensure that students' and parents' rights are preserved throughout the decision-making process. For instance, parents must be notified in writing before the school takes any action that might change their child's educational program. If the parents and school system disagree on the most appropriate placement for a child, mediation or a hearing can be used to resolve the differences.

IDEA has had a significant impact on the nature of special education. More and more, teachers are realizing that truly inclusive practices require differentiated instruction for *all* students, not just those with formally identified needs. Rather than provide specialized instruction in a separate classroom, many special education teachers now partner with regular classroom teachers to jointly teach all students—both those with disabilities and those without.

Potential Benefits and Drawbacks of Inclusion

Despite the mandates of IDEA, inclusive practices for students with disabilities have been controversial. Some experts argue that students are most likely to develop normal peer relationships and social skills when they participate fully in their school's overall social life. But others worry that when students with special needs are in a regular classroom for the entire school day, they can't get the intensive specialized instruction they may need. Furthermore, classmates without disabilities may stigmatize, avoid, or bully students who appear to be odd or incompetent in some way (Blake et al., 2012; Hamovitch, 2007).

Research suggests that attending general education classes for part or all of the school day can have several positive outcomes for students with disabilities:

- Academic achievement equivalent to (and sometimes higher than) that in a self-contained classroom
- More appropriate classroom behavior, better social skills, and more frequent interaction with peers without disabilities

- Better sense of self *if* the school environment is one in which all students accept and respect individual differences among their peers (Halvorsen & Sailor, 1990; Hamovitch, 2007; Hattie, 2009; Hunt & Goetz, 1997; MacMaster et al., 2002; Slavin, 1987; Soodak & McCarthy, 2006; Stainback & Stainback, 1992)

We're especially likely to see such outcomes when students understand the nature of their disabilities and when instruction and materials are tailored to students' specific needs, perhaps in their regular classrooms or perhaps in short resource-room sessions (e.g., Swanson et al., 1999). Appropriate **assistive technology**—electronic devices and other equipment that can enhance students' abilities and performance—is also extremely valuable in helping students successfully participate in the curriculum and social life of general education classrooms.

General education students often benefit from inclusive practices as well. For example, they may be able to take advantage of special supports designed for students with disabilities—perhaps detailed study guides or supplementary explanations (Cole et al., 2004). Furthermore, they discover that individuals with special needs are in many respects very much like themselves (Hunt & Goetz, 1997; Staub, 1998). One of us authors often thinks about her son Jeff's friendship with Evan, a classmate with severe physical and cognitive disabilities, during their third-grade year. A teacher had asked Jeff to be a special friend to Evan, interacting with him at lunch and whenever possible. Although largely unable to speak, Evan always made it clear through gestures and expressions that he was delighted to spend time with his friend, giving Jeff—who was quite shy—a boost in social self-confidence. Several years later, Jeff reflected on this friendship:

> It made me realize that Evan was a person too. It made me realize that I could have a friendship with a boy with disabilities. Doing things that made Evan happy made me happy as well. I knew that *Evan* knew that we were friends.

It's essential, of course, that general education students treat classmates who have disabilities in respectful and supportive ways and, better still, forge friendships with these classmates. As teachers, we can do several things to nurture good relationships between students:

- Explicitly point out the strengths of a student with a disability, and that all students in the class have equal status.
- Ask students with and without disabilities to assist others in their areas of strength.
- Plan academic and recreational activities that allow students with and without disabilities to work together, with little adult guidance or interference.
- Encourage students with disabilities to participate in extracurricular activities and community events (Bassett et al., 1996; DuPaul et al., 1998; Hamovitch, 2007; Madden & Slavin, 1983; Turnbull et al., 2000).

There are advantages and drawbacks to inclusion for classroom teachers as well. On the positive side, the inclusion of students with disabilities can lead to greater acceptance of individuals with disabilities among other students and increased opportunities for students to work in diverse groups and explain concepts to one another. Nevertheless, the inclusion of students with disabilities in regular classrooms does introduce some challenges for teachers. For example, teachers may need to differentiate instruction to a greater degree, prepare alternative materials for some students, and spend extra time with students with disabilities.

Identifying Students' Special Needs

Experts don't completely agree about how to define various categories of special needs—especially those not involving obvious physical conditions—or about how best to identify students who fit into each category. In the United States, IDEA provides specific identification criteria for various disabilities. Students with disabilities who don't meet IDEA's criteria are often eligible for special educational services under Section 504 of the Rehabilitation Act of 1973 (sometimes referred to simply as *Section 504*). This act stipulates that institutions that benefit from federal funding (including public schools) can't discriminate against individuals on the basis of a disability. Procedures for assessing and accommodating students' disabilities are less prescriptive in Section 504 than they are in IDEA—a situation that can be either advantageous or disadvantageous, depending on the circumstances.

One approach to identification that is gaining increasing support (and that is endorsed in the 2004 reauthorization of IDEA) involves determining **response to intervention (RTI)**. In this approach, a teacher keeps an eye out for any student who has exceptional difficulty with basic skills in a certain domain (e.g., in reading or math) despite normal whole-class instruction *and* intensive follow-up small-group instruction that have both been shown *by research* to be effective for most children. Such a student is referred for in-depth assessments of various characteristics and abilities. If the assessment rules out obvious disabling conditions (e.g., significant genetic abnormalities, sensory impairments), the student may be identified as having a cognitive impairment—often, but not always, falling within the category of learning disabilities—and is therefore eligible for special services (e.g., Fletcher & Vaughn, 2009; Fuchs & Fuchs, 2009; Mellard & Johnson, 2008).

An approach that focuses on promoting adaptive behavior is known as **Positive Behavior Intervention and Supports (PBIS)**. When PBIS is used as a program across an entire school, it is known as **Schoolwide Positive Behavioral Interventions and Supports (SWPBIS)** (Ögülmüs, & Vuran, 2016; Sugai & Horner, 2006). The framework is based on promoting positive or "good" behavior, rather than on punishing bad behavior. As with RTI, when students are identified as displaying particular problematic behaviors that cannot be adequately addressed through schoolwide efforts, those students are then provided with more individualized approaches to address specific behavioral issues. We will return to this in Chapter 13, when we discuss strategies for creating a positive classroom environment.

Educators often implement broader approaches that can address both learning and behavioral concerns simultaneously. **Multi-Tiered Systems of Support (MTSS)** is a term that describes intervention efforts aimed at addressing concurrent issues that affect students' learning (Forman & Crystal, 2015; Jimerson et al., 2016; Leach & Helf, 2016; Sugai et al., 2016). These approaches can be very effective, because all teachers in the school are trained in using evidence-based practices to support the learning and behavior of all students in the school. When all of the staff are aligned in these efforts, they are better able to identify students who need more targeted, individualized interventions.

Whenever we identify a student as having a particular disability, however, we run the risk of focusing other people's attention on weaknesses rather than on the student's many strengths and age-typical characteristics. To minimize such an effect, special educators urge us all to use **people-first language** when referring to students with disabilities—in other words, to mention the person *before* the disability. For instance, we might say *student with a learning disability* rather than *learning-disabled student*, or *student who is blind* rather than *blind student.* Some examples of recommendations regarding respectful language that should most often be used when referring to individuals with disabilities is presented in Table 5.3. However, it is also important to acknowledge your individual students' preferences (Vivanti, 2020). Helpful resources with information about people-first language are available at: https://www.disabilityisnatural.com//

In upcoming sections of the chapter, we group students with special needs into five general categories. Table 5.4 lists the specific kinds of special needs that fall within each category. Disabilities covered by IDEA appear in **red** in the table.

Table 5.3 Examples of Outdated and Updated Language when Referring to Individuals with Disabilities

Outdated Term	Suggested Replacement
Autistic	Has autism
Crippled	Has a disability
The disabled	People with disabilities
A handicap	A disability
Handicapped bathrooms	Accessible bathrooms
Insane person or mentally ill	Person with a mental health condition
Learning disabled	Has a learning disability
Mental retardation	Developmental/cognitive/intellectual disability
Suffering from a disability	Has a disability

SOURCE: U.S. Office of Disability Rights, 2022.

STUDENTS IN INCLUSIVE SETTINGS

Table 5.4 General and Specific Categories of Students with Special Needs

General Category	Specific Categories	Description
Students with specific cognitive or academic difficulties: These students exhibit an uneven pattern of academic performance; they may have unusual difficulty with certain kinds of tasks, yet perform quite successfully on other tasks.	Learning disabilities	Difficulties in specific cognitive processes (e.g., in perception, language, or memory) that cannot be attributed to other disabilities, such as general intellectual disabilities, emotional or behavioral disorders, or sensory impairments
	Attention-deficit hyperactivity disorder (ADHD) (not specifically covered by IDEA, but students are often eligible for special services under the IDEA category Other Health Impairments)	Disorder marked by either or both of these characteristics: (1) difficulty focusing and maintaining attention and (2) frequent hyperactive and impulsive behavior
	Speech and communication disorders	Impairments in spoken language (e.g., mispronunciations of certain sounds, stuttering, or abnormal syntactical patterns) or in language comprehension that significantly interferes with classroom performance
Students with social or behavioral problems: These students exhibit social, emotional, or behavioral difficulties serious enough to interfere significantly with their academic performance.	Emotional and behavioral disorders	Emotional states and behaviors that are present over a substantial period and significantly disrupt academic learning and performance
	Autism spectrum disorders	Disorders marked by impaired social cognition, social skills, and social interaction, as well as repetition of certain idiosyncratic behaviors; milder forms associated with normal development in other domains; extreme forms associated with delayed cognitive and linguistic development and highly unusual behaviors
Students with general delays in cognitive and social functioning: These students exhibit low achievement in virtually all academic areas and have social skills typical of much younger children.	Intellectual disabilities	Significantly below-average general intelligence and deficits in adaptive behavior (i.e., in practical and social intelligence); deficits are evident in childhood and typically appear at an early age
Students with physical or sensory challenges: These students have disabilities caused by diagnosed physical or medical problems.	Physical and health impairments	Physical or medical conditions (usually long term) that interfere with school performance because of limited energy and strength, reduced mental alertness, or little muscle control
	Visual impairments	Malfunctions of the eyes or optic nerves that prevent normal vision even with corrective lenses
	Hearing loss	Malfunctions of the ear or associated nerves that interfere with the perception of sounds within the frequency range of normal speech
Students with advanced cognitive development: These students have unusually high ability in one or more areas.	Giftedness (not covered by IDEA unless a disability is also present)	Unusually high ability or aptitude in one or more domains, usually within the academic curriculum, requiring special educational services to help students meet their full potential

Students with Specific Cognitive or Academic Difficulties

Learning Objective 5.4 **Explain how you might adapt your instruction and classroom practices to the unique strengths and limitations of students with various disabilities.**

Some students with special educational needs show no outward signs of physical disability yet have cognitive difficulties that interfere with their ability to learn certain kinds of academic material or perform certain kinds of classroom tasks. Such students include those with learning disabilities, attention-deficit hyperactivity disorder, and speech and communication disorders.

Learning Disabilities

Although there are varying definitions of learning disabilities, students with **learning disabilities** have significant difficulties in one or more specific cognitive processes that can't be attributed to cultural or linguistic diversity, generally delayed cognitive development, emotional problems, sensory impairment, or environmental deprivation. Such difficulties often appear to result from specific and possibly inherited brain dysfunctions (American Psychiatric Association [APA], 2013; Gregg, 2009; Luedke & Decker, 2021; K. Pugh & McCardle, 2009). Figure 5.3 lists several forms that a learning disability might take.

Common Characteristics In general, students with learning disabilities are different from one another in many more ways than they are similar. They typically have many strengths, but may also face challenges:

- Poor language, reading and writing skills
- Ineffective learning and memory strategies
- Trouble concentrating on and completing assigned tasks, especially in the face of distractions
- Poor sense of self and low motivation for academic tasks, especially in the absence of individualized assistance in areas of difficulty
- Poor motor skills
- Poor social skills (Estell et al., 2008; Gathercole et al., 2006; Gregg, 2009; Job & Klassen, 2012; Pugh & McCardle, 2009; Swanson, 2014; Waber, 2010; Zhang et al., 2020)

Figure 5.3 Examples of cognitive processing deficiencies in students with learning disabilities.

Perceptual difficulty. Students may have trouble understanding or remembering information they receive through a particular modality, such as vision or hearing.

Memory difficulty. Students may have less capacity for remembering information over either the short or long run (i.e., they may have problems with either *working memory* or *long-term memory*).

Metacognitive difficulty. Students may have difficulty using effective learning strategies, monitoring progress toward learning goals, and directing their own learning.

Oral language processing difficulty. Students may have trouble understanding spoken language or remembering what they have been told.

Reading difficulty. Students may have trouble recognizing printed words or comprehending what they read; extreme form is known as *dyslexia.*

Written language difficulty. Students may have problems in handwriting, spelling, or expressing themselves coherently on paper; an extreme form is known as *dysgraphia.*

Mathematical difficulty. Students may have trouble thinking about or remembering information involving numbers; an extreme form is known as *dyscalculia.*

Social perception difficulty. Students may have trouble interpreting others' social cues and signals and thus may respond inappropriately in social situations.

Music processing difficulty. Students may have little sensitivity to differences in pitch and be unable to recognize familiar tunes; an extreme form is known as *amusia.*

By no means do such characteristics describe *all* students with learning disabilities. For instance, some are attentive in class, and some are socially skillful and popular with peers.

Sometimes learning disabilities reflect a mismatch between students' developing abilities, on the one hand, and grade-level expectations for performance, on the other (Waber, 2010). For instance, as students reach middle school, they're typically expected to work with little or no supervision, yet students with learning disabilities don't always have the time management skills they need to get things done (Gregg, 2009). In high school classes, learning may require reading and studying sophisticated textbooks, yet the average high school student with a learning disability reads at a fourth- to fifth-grade level and has few, if any, effective study strategies (Cutting et al., 2009; Meltzer & Krishnan, 2007). And sometimes, students may have difficulties with specific aspects of learning, such as being able to understand and use symbols appropriately in courses like math or chemistry. Dylan, who was identified as having a math learning disability, described one of her struggles as follows: "I found my entire life, my biggest problem with math is notation. I struggle so much, I can't even get to the point of trying to understand the concept of something if the notation just confuses me" (Lewis & Lynn, 2018, p. 438).

The following exercise can give you a sense of how these students might feel under such circumstances.

Experiencing Firsthand

A Reading Assignment

Read the following passage carefully. You'll be tested on its contents later in the chapter.

> In some learning situations (e.g., a classroom discussion in which students are supporting various arguments on a controversial socioscientific issue), individuals may demonstrate a level of commitment in justifying their plausibility judgments about a particular explanation. However, in many if not most learning situations, plausibility judgments are tentative and not necessarily related to commitment toward an idea. Believability bears greater similarity to probability (i.e., an explanation that has high probability—by definition—means that other alternatives are of low probability, or in the case of belief, not considered). (Lombardi, Nussbaum, & Sinatra, 2016, pp. 38–39)

How well do you think you will perform on the upcoming test about this passage?

The passage you just read is a fairly typical one from *Educational Psychologist*, a professional journal written for people with advanced education (e.g., doctoral degrees) in educational psychology. Hence, it was written well above a typical college student's reading level. We won't *really* test you on the passage's contents, but we authors hope that the exercise gave you a feel for the frustration that high school students with learning disabilities might experience. For many students with learning disabilities, completing school assignments may seem like they are constantly fighting an uphill battle. Perhaps for this reason, a higher-than-average percentage of students with learning disabilities drop out of school before graduation (Gregg, 2009).

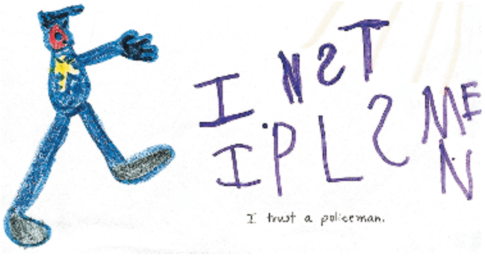
Adapting Instruction Instructional strategies for students with learning disabilities must be tailored to students' specific strengths and weaknesses. If you become a regular classroom teacher, you will quite likely partner with a special educator when you have students with learning disabilities in your classes. You and the special educator will work collaboratively to adapt your instruction at times. Several strategies should benefit many of these students:

- *Minimize distractions.* Because many students with learning disabilities are easily distracted, we should minimize the presence of other stimuli that might compete for their attention—for example, by pulling down window shades if other classes are playing outside, by asking students to put their smartphones away, and by asking students to clear away materials they don't immediately need (Buchoff, 1990).
- *Present new information in an explicit and well-organized manner.* Most students with learning disabilities learn more successfully when instruction directly communicates what they need to learn, rather than requiring them to draw inferences and synthesize ideas on their own. Frequent and carefully structured practice of important skills is also critical (Fletcher et al., 2007; Stein & Krishnan, 2007; U.S. Department of Education, 2014).
- *Present information in multiple sensory modalities.* Because some students with learning disabilities have trouble learning through a particular sensory modality, we need to think broadly about the modalities we use to communicate information. Thus, we might incorporate videos, graphics, and other visual materials, and we might encourage students to record lectures. Similarly, when teaching young children to recognize letters, we might have them not only look at the letters but also trace large, textured letter shapes with their fingers (Florence et al., 2004; Stein & Krishnan, 2007; Wood & Rosbe, 1985).
- *Present stimulating, novel materials,* which may be particularly helpful in preventing students from getting bored and maintaining their attention while reading (Beike & Zentall, 2012). For example, stories that have a surprising turn of events may be particularly beneficial for the engagement of students with learning disabilities during reading.
- *Analyze students' errors for clues about processing difficulties.* As an example of this strategy, look at 7-year-old Daniel's attempt to write "I trust a policeman" in Figure 5.4. Daniel captured several sounds correctly, including the "s" and final "t" sounds in *trust* and all of the consonant sounds in *policeman.* However, he misrepresented the first two consonant sounds in *trust,* replacing the *t* and *r* with an *N.* He also neglected to represent most of the vowel sounds, and two of the three vowels he did include (*I* for the article *a* and the *E* near the end of *policeman*) are incorrect. We might suspect that Daniel has difficulty hearing all the distinct sounds in spoken words and matching them with the letters he sees in written words. Such difficulties are quite common in students with significant reading disabilities (Goswami, 2007; N. Gregg, 2009; Pugh & McCardle, 2009).
- *Teach study skills and learning strategies.* Many students with learning disabilities benefit from being taught specific strategies for completing assignments and remembering subject matter (Joseph & Konrad, 2009; Meltzer, 2007; Wilder & Williams, 2001). For example, we might teach strategies for taking notes and organizing homework, as well as specific *mnemonics,* or memory tricks, to help students remember facts.

Chapters 7, 8, and 12 provide many strategies for helping students study and learn.

- *Provide paper or electronic scaffolding that can support students as they study and work.* We might develop study guides, outlines, or graphics that help students identify and interrelate important concepts and ideas. We could provide a copy of a highly organized classmate's lecture notes. And we can teach students how to use the grammar and spell checkers in word processing software (Gregg, 2009; Mastropieri & Scruggs, 1992; Meltzer, 2007).

Figure 5.4 Seven-year-old Daniel's attempt to write "I trust a policeman."



Patricia Belcher

Attention-Deficit Hyperactivity Disorder (ADHD)

Virtually all students are apt to be inattentive, hyperactive, and impulsive at one time or another. But those with **attention-deficit hyperactivity disorder (ADHD)** typically have significant and chronic deficits in these areas, as reflected in the following identification criteria:

- *Inattention.* Students may have considerable difficulty focusing and maintaining attention on assigned tasks, especially when appealing alternatives are available. They may have trouble listening to and following directions, and they may make careless mistakes.
- *Hyperactivity.* Students may seem to have an excess amount of energy. They're apt to be fidgety and may move around the classroom at inappropriate times.
- *Impulsivity.* Students almost invariably have trouble inhibiting inappropriate behaviors. They may blurt out answers, begin assignments prematurely, or engage in risky or destructive behaviors without thinking about potential consequences. (APA, 2000; Barkley, 2006; Gatzke-Kopp & Beauchaine, 2007; Gregg, 2009)

Students with ADHD don't necessarily show all three of these characteristics. For instance, some are inattentive without also being hyperactive, as is true for Tim in the opening case study. But all students with ADHD appear to have one characteristic in common: an *inability to inhibit inappropriate thoughts, inappropriate actions, or both* (Barkley, 2006, 2010; Casey, 2001; Nigg, 2010). Tim, for example, is easily distracted by his thoughts and daydreams when he should be focusing on a lesson.

The prevalence of ADHD in the United States may surprise you. Approximately 6% of youth between the ages of 2 and 17 in the United States are formally diagnosed as having ADHD; across the world, it is estimated that about 5% of children have ADHD, although it is underdiagnosed in many countries. More than half of U.S. students (62%) have taken medication for ADHD. Boys are about twice as likely as girls to be diagnosed with ADHD. And some evidence suggests that children who start elementary school at younger ages are more likely to be diagnosed with ADHD (Layton et al, 2018). Diagnoses have increased by over 50% since the early 2000s. (The increase in diagnoses is due to a number of factors, including greater awareness of ADHD and thus more frequent diagnoses) (Centers for Disease Control, 2016; National Center for Learning Disabilities, 2014; Sayal et al., 2018).

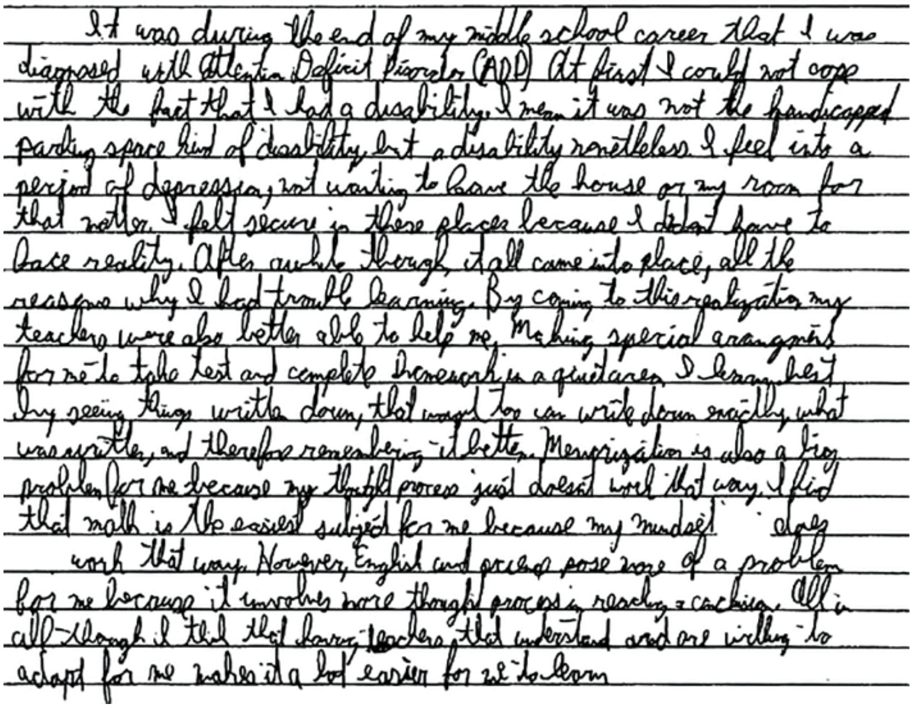
In many instances, ADHD appears to be the result of brain abnormalities that limit students' ability to focus their attention and control their behaviors (e.g., Kadziela-Olech et al., 2015). Sometimes these abnormalities are inherited, but sometimes, instead, they're the result of toxic substances in children's early environments—perhaps high lead content in the paint dust of old buildings (Accardo, 2008; Barkley, 2010; Faranoe et al., 2005; Gatzke-Kopp & Beauchaine, 2007; Nigg, 2010).

Common Characteristics In addition to inattentiveness, hyperactivity, and impulsivity, students identified as having ADHD may have characteristics such as these:

- Exceptional imagination and creativity; exceptionally detailed memories
- Certain specific cognitive processing difficulties and low school achievement
- Problems with planning and time management
- Classroom behavior problems (e.g., disruptiveness, noncompliance)
- Greater use of media (e.g., watching TV or using a computer)
- Poor social skills and interpersonal difficulties
- Increased probability of substance abuse in adolescence (Barkley, 2006; Gatzke-Kopp & Beauchaine, 2007; Goldstein & Rider, 2006; Gregg, 2009; Hallowell, 1996; Nikkelen et al., 2014; Skowronek et al., 2008; Tarver et al, 2014)

Students' attention, hyperactivity, and impulsiveness problems may diminish somewhat in adolescence, but they don't entirely disappear, making it difficult for students to handle the increasing demands that come in high school; for many, ADHD continues

Figure 5.5 A high school student writes about coming to terms with having ADHD. Note that this student experiences some sadness about having a disability, but also some optimism about getting more appropriate support from his teachers.



It was during the end of my middle school career that I was diagnosed with Attention Deficit Disorder (ADD) At first I could not cope with the fact that I had a disability. I mean it was not the handicapped parking space kind of disability, but a disability nonetheless. I feel into a period of depression, not wanting to leave the house or my room for that matter. I felt secure in these places because I didn't have to face reality. After awhile though, it all came into place, all the reasons why I had trouble learning. By coming to this realization my teachers were also better able to help me, Making special arrangments for me to take test and complete homework in a quiet area. I learn best by seeing things written down, that way I too can write down exactly what was written, and therefore remembering it better. Memorization is also a big problem for me because my thought process just doesn't work that way. I find that math is the easiest subject for me because my mindset does work that way. However, English and science pose more of a problem for me because it involves more thought process in reading & catching. All in all though I think that having teachers that understand and are willing to adapt for me makes it a lot easier for me to learn

into and sometimes throughout adulthood, at times affecting the ability to make sound, rational decisions (Mowinckel et al., 2015; Tarver et al., 2014). Accordingly, students with ADHD are at greater-than-average risk for dropping out of school (Barkley, 2006; Goldstein & Rider, 2006; Gregg, 2009; Hart et al., 1995). ADHD continues to be a lifelong issue for some individuals (Tarver et al., 2014). Some research suggests that individuals with ADHD are at an increased risk of attempting suicide (Fuller-Thompson, 2020). Figure 5.5 displays a note written by a high school student who was recently identified as having ADHD. Note that this student experiences difficulties in coming to terms with this diagnosis, but also appreciates the fact that teachers are now able to provide better support.

Medication and ADHD Many children and adolescents who have been diagnosed with ADHD are prescribed medication to alleviate symptoms. Although there is debate about the possible over-prescription of drugs for children and adolescents with ADHD (e.g., Corrigan, 2012; Pelham, 2012), current research suggests that medication may be helpful in some instances:

- For some, the effects of the medicine are strong; but for others, the effects are modest at best.
- Medication alleviates symptoms of ADHD but does not cure it.
- Medication is most effective when the dosage is closely monitored and adjusted as needed.
- Some medications are stimulants and others are non-stimulants. The stimulants support more effective communications between various networks of brain cells; the non-stimulants include a variety of other benefits.
- Medication can be effective in preschoolers, particularly when they have few other additional mental disorders.
- Among preschoolers, some behavioral interventions can be implemented successfully instead of medication.

- When ADHD symptoms are moderate, non-medical treatments often can be attempted before trying medications (Kortekaas-Rijlaarsdam et al., 2018; National Collaborating Centre for Mental Health, 2009; National Resource Center on ADHD, 2018; National Institutes of Health, 2013).

Adapting Instruction Some students with ADHD take medication that helps them control their symptoms, but medication alone is rarely sufficient to enable classroom success; individually tailored educational interventions are also in order (Purdie et al., 2002). The strategies previously listed for students with learning disabilities can often be helpful for students with ADHD. Researchers and practitioners have offered several additional suggestions:

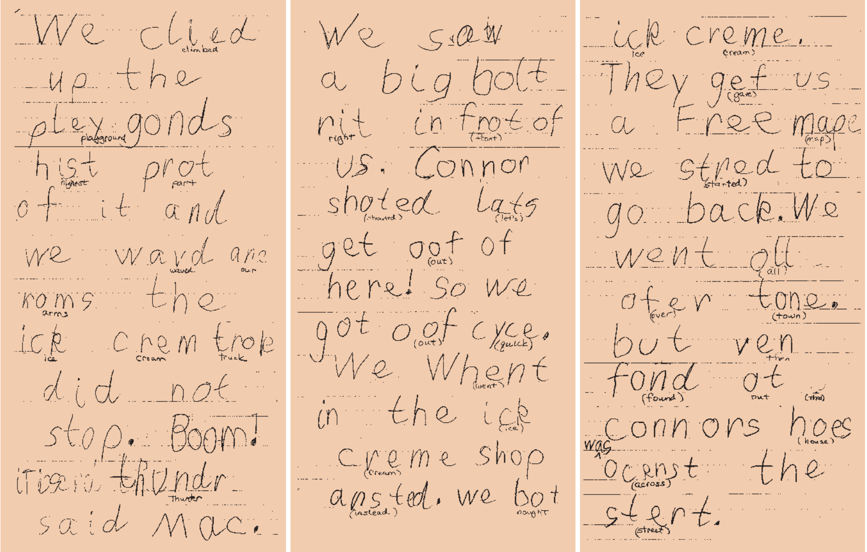
- *Modify students' work environments and schedules.* Students with ADHD do better in a work environment that features minimal distractions, some degree of structure, and ongoing teacher monitoring. Ideally, students should have most academic subjects and challenging tasks in the morning rather than in the afternoon, as the symptoms of ADHD tend to get progressively worse as the day goes on (Barkley, 2006; Gregg, 2009).
- *Explicitly facilitate attention and concentration.* Students may benefit from soundproofing headphones or "white noise" machines that block out potentially distracting sounds, or, for a low-tech alternative, we might encourage them to move to a new location if their current one presents too many distractions (Buchoff, 1990; Gregg, 2009). Also, some computer applications give students practice in focusing and keeping their attention on specific stimuli (e.g., Klingberg et al., 2002; Rueda et al., 2005). Even using colored highlighting to point out particularly relevant information in reading materials or math problems may improve performance (Kercood et al., 2012).
- *Provide outlets for excess energy.* To help students control excess energy, we should intersperse quiet academic work with frequent opportunities for exercise (Pellegrini & Bohn, 2005; Pfiffner et al., 2006). We might also give students a settling-in time after recess or lunch—perhaps reading an excerpt from a high-interest book or article—before asking them to engage in an activity that involves quiet concentration (Pellegrini & Horvat, 1995).
- *Help students organize and use their time effectively.* For example, we can show students how to prioritize activities, create to-do lists, and establish a daily routine that they post on their desks. We can break large tasks into smaller ones and set a short time limit for each subtask. And we can provide a folder in which students transport homework assignments to and from school (Buchoff, 1990; Gregg, 2009; Pfiffner et al., 2006).

Speech and Communication Disorders

Speech and communication disorders are impairments in spoken language or language comprehension that significantly interfere with academic performance. Examples include persistent articulation problems (e.g., see Figure 5.6), stuttering, abnormal syntactical patterns, and difficulty understanding other people's speech. By the time children reach the first grade, about 5% have noticeable speech disorders (National Institute of Deafness and Other Communication Disorders, 2016). Sometimes, but not always, these children have difficulty perceiving and mentally processing particular aspects of spoken language—a subcategory of speech and communication disorders known as *specific language impairments.* Often—but again, not always—the source of the disorder can be traced to heredity or brain abnormalities (Bishop, 2006; Locke, 1993; National Academies of Sciences, Engineering, & Medicine, 2016; Spinath et al., 2004).

Specific language impairments are described in Chapter 2.

Figure 5.6 Seven-year-old Isaac receives speech therapy at school to address his consistent mispronunciation of certain sounds (such as pronouncing "th" as "v"). In his writing, he sometimes spells words as he says them rather than as he hears them (for instance, he writes *ven* for *then*).



We clied
climbed
up the
pley gonds
playground
hist prot
highest part
of it and
we ward are
waved our
roms the
arms
ick crem trok
ice cream truck
did not
stop. Boom!
iT was thundr
Thunder
said Mac.

We saw
a big bolt
rit in frot of
right (front)
us. Connor
shoted lats
(shouted) (let's)
get oof of
(out)
here! So we
got oof cyce.
(out) (quick)
We Whent
(went)
in the ick
(ice)
creme shop
(cream)
apsted. we bot
(instead) bought

ick creme.
ice (cream)
They gef us
(gave)
a Free mape
(map)
we stred to
(started)
go back. We
went oll
(all)
ofer tone.
(ever) (town)
but ven
then
fond ot
(found) out (that)
connors hoes
(house)
was
ocrnst the
(across)
stert.
(street)

Jayme Rhoades

Common Characteristics Although some students with speech and communication disorders have other disabilities as well, many are just typical students in most ways. Nevertheless, the following characteristics are fairly common:

- Reluctance to speak; embarrassment and self-consciousness when speaking
- Difficulties in reading and writing (Fey et al., 1995; Heward, 2009; LaBlance et al., 1994; Rice et al., 1993)

Adapting Instruction Usually, a trained specialist will work with students to help them improve or overcome their speech and communication difficulties. Although students may display deficits in only one noticeable part of speech, the specialist quite likely will intervene and work on a variety of aspects of speech (Owens et al., 2015). Nevertheless, general education teachers can assist in several ways:

- *Encourage regular oral communication.* Students with speech and communication disorders need as much practice in classroom-based public speaking as their classmates do. Thus, we should encourage them to talk in class, provided that doing so doesn't create exceptional stress (Hallahan et al., 2009; Patton et al, 1996). We also should provide models of sentences and phrases that are easy for the child to understand, but also grammatically correct (Owens et al., 2015).
- *Listen patiently.* When students have trouble expressing themselves, we might be tempted to assist them, perhaps by finishing their sentences for them. But we help them more when we allow them to complete their own thoughts, and we must encourage their classmates to be equally patient (Heward, 2009; Patton et al., 1996). One of the authors of this book had a friend during adolescence who stuttered. In order to help the student, other friends often would complete sentences for him when he was struggling to articulate a thought; however, when it was pointed out that it would be more helpful to listen patiently and allow the student to complete his sentence for himself, conversations got much easier.
- *Ask for clarification when a message is unclear.* If we haven't entirely understood what students are saying, we should explain what we *did* understand and ask for clarification of the rest. Honest feedback helps students learn how well they're communicating (Patton et al., 1996).

- *Use augmentative and alternative communication (AAC) when students have little or no oral language.* Some forms of AAC involve technology; for example, a laptop or tablet might have a touchscreen that "speaks" when a student puts a finger on particular words or symbols. Others are nonelectronic; for example, we might give students a set of pictures or teach them some gestures they can use to represent their thoughts (Beukelman & Mirenda, 2005). For those of us who don't have easy access to speech experts, assessments and interventions can be provided via the Internet (Waite et al., 2010, 2012).

General Recommendations

In addition to the strategies described previously, several general strategies apply to many students with specific cognitive or academic difficulties:

- *Get an early start on appropriate interventions.* When students lack basic concepts and skills on which their future learning will depend, intensive instruction to fill in the gaps—and the earlier, the better—can often make a significant difference in their achievement over the long run (Fuchs et al., 2005; Waber, 2010; Wanzek & Vaughn, 2007).
- *Take skill levels into account when assigning reading materials.* Even after intensive reading instruction, many students with specific cognitive or academic difficulties continue to have poor reading skills. Thus, we may sometimes need to identify alternatives to standard grade-level textbooks for presenting academic content. For example, we might reduce the amount of required reading, substitute materials written on a simpler (yet not babyish) level, allow students to have extra time to complete reading assignments, or present information through some medium other than printed text—perhaps audio recordings or text-to-speech computer software (Gregg, 2009; Mastropieri & Scruggs, 2007). Students may also need extra guidance and support when assignments require them to find and read information online (Sampson et al., 2007).
- *Clearly describe expectations for academic performance.* Students will have an easier time accomplishing classroom tasks if they're told, in concrete and precise terms, exactly what's expected of them (Meltzer & Krishnan, 2007). For example, before students begin a science lab activity, we might first remind them to carefully follow the steps described on the lab sheet, then review safety precautions, and finally provide a written list of components that should be included in lab reports.
- *Take steps to enhance self-confidence and motivation.* Students with a long history of failure at academic tasks need to see that they're making progress and that they do some things quite well. For instance, we can give them daily or weekly goals we know they can attain. We can also have them keep journals in which they describe the successes they've achieved each day. And, of course, we should give them opportunities to do tasks at which they excel (Buchoff, 1990; Stein & Krishnan, 2007).

Chapters 10 and 11 describe strategies to enhance motivation and self-confidence.

Students with Social or Behavioral Problems

Many students have minor social, emotional, or behavioral difficulties at one time or another, particularly during times of unusual stress or major life changes. Often, these problems are temporary ones that require only a little extra support from caring adults and peers. At other times, problems are more enduring but *don't* reflect a disability. Perhaps a student's temperament is a poor fit with a teacher's instructional strategies—for instance, an especially fidgety child may perform poorly on lengthy seatwork assignments (Keogh, 2003). In such situations, students' problems may decrease or disappear with a change in instructional practices or classroom management strategies.

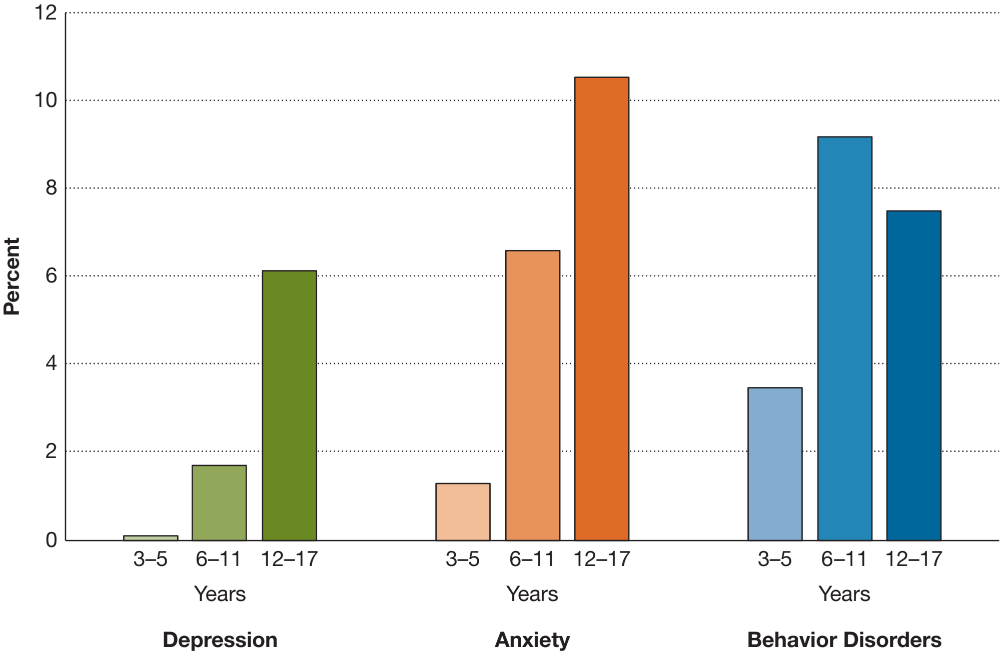
However, some students show a pattern of engaging in behaviors that consistently interfere with their learning and performance *regardless* of the teacher and the classroom environment. In this section, we'll look at two groups of students who fit into this category: those with emotional and behavioral disorders and those with autism spectrum disorders.

Emotional and Behavioral Disorders

Students with **emotional and behavioral disorders** are identified as students with special needs—and therefore qualify for special educational services—when their problems have a substantial negative impact on classroom learning. Although these students represent between 3% and 7% of the population of students in the United States, less than 1% receive special education services under this categorization (Centers for Disease Control [CDC], 2017a; Ghandour et al., 2019; Lane et al., 2012). Symptoms of emotional and behavioral disorders typically fall into one of two broad categories. **Externalizing behaviors** have direct or indirect effects on other people; examples include aggression, defiance, stealing, and general lack of self-control. **Internalizing behaviors** primarily affect the student with the disorder; examples include severe anxiety or depression, exaggerated mood swings, withdrawal from social interaction, and eating disorders. Students with externalizing behaviors—who are more likely to be boys than girls—are more likely to be referred for evaluation and possible special services. However, students with internalizing behaviors—who are more likely to be girls than boys—can be just as much at risk for school failure (Angold et al., 2003; Gay, 2006; Hayward, 2003). These disorders need to be taken seriously because, in addition to school failure, students with externalizing and internalizing behaviors are more at risk for serious mental health issues, including thinking about or attempting suicide (Peter & Roberts, 2010).

Emotional and behavioral disorders are more common in younger than older students. As you can see in Figure 5.7, behavioral disorders are more common in children ages 6–11 than in either younger or older students; nevertheless, students of all ages can be identified as experiencing emotional or behavioral problems.

Figure 5.7 Depression, anxiety, and behavioral disorders by age:



SOURCE: Centers for Disease Control, 2021, https://www.cdc.gov/childrensmentalhealth/data.html

Report suspicions about child maltreatment *immediately* to school administrators or child protective services.

Some emotional and behavioral disorders result from environmental factors, such as stressful living conditions, child maltreatment, or family alcohol or drug abuse (Davies & Woitach, 2008; Glaser, 2000; Maughan & Cicchetti, 2002). But biological causes (e.g., inherited predispositions, chemical imbalances, brain injuries) may also be involved, either by themselves or through interaction with environmental conditions (Dodge, 2009; Raine, 2008; Yeo et al., 2007). Some students with a genetic predisposition for an emotional or behavioral disorder exhibit few, if any, signs until adolescence, as the following case illustrates:

> As a ninth grader, Kirk was a well-behaved, likeable student who earned As and Bs and showed particular promise in science and math. But in tenth grade, his grades began to decline, and he increasingly exhibited hostile and defiant behaviors. When Kirk failed three classes during the fall of his twelfth-grade year, the principal convened a meeting with him, his parents, and his faculty advisor to discuss how to help Kirk get back on track. At the meeting, the principal described several occasions when Kirk had acted disoriented, belligerent, and seemingly "high" on drugs. Despite his strong desire to attend college the following year, Kirk sat at the meeting smirking (seemingly gleeful about his predicament) and focusing his attention on sorting pieces of trail mix in a bowl on the conference room table. By the end of the meeting, the principal was so infuriated that she expelled him from school.
>
> Over the next few weeks, Kirk's mental condition and behavior continued to deteriorate, to the point that he was soon arrested, placed in a juvenile detention facility, and eventually hospitalized in the state mental institution.

Kirk was ultimately diagnosed with *bipolar disorder,* a condition that is usually inherited and is characterized by excessive mood swings and in some cases (like Kirk's) by distorted thought processes. Bipolar disorder often doesn't appear until adolescence, even though its biological underpinnings have been present since birth (Griswold & Pessar, 2000).

When students have emotional or behavioral disorders, their inappropriate behaviors interfere not only with achievement but also with peer relationships, leading to social as well as academic failure. Some of these students may seek the companionship of the few peers who will accept them—peers who typically behave in similarly inappropriate ways and may introduce one another to drugs, alcohol, or criminal activity (Snyder et al., 2008; Webber & Plotts, 2008). Sadly, many youth who have emotional or behavioral disorders do not receive the services and supports that they need. Often, boys with externalizing behaviors receive support, but others do not receive sufficient services (Hallahan et al., 2015).

Common Characteristics Students with emotional and behavioral disorders differ considerably in their abilities and personalities. However, in addition to the difficulty in maintaining healthy peer relationships, you may observe one or more of the following characteristics:

- Frequent absences from school
- Deteriorating academic performance with increasing age
- Often, but not always, below-average intelligence
- Low self-esteem
- Aggressive or withdrawn behaviors
- Angry or argumentative
- Rule-breaking
- Little or no empathy for others' distress
- Significant substance abuse (CDC, 2017a; Grinberg & McLean-Heywood, 1999; Harter, 1999; Kauffman & Landrum, 2013; Leiter & Johnsen, 1997; McGlynn, 1998; Richards et al., 1995; Turnbull et al. 2010; Webber & Plotts, 2008)

Some students with emotional and behavioral disorders have other special needs as well, including learning disabilities, ADHD, or giftedness (Fessler et al., 1991; Gatzke-Kopp & Beauchaine, 2007; Webber & Plotts, 2008).

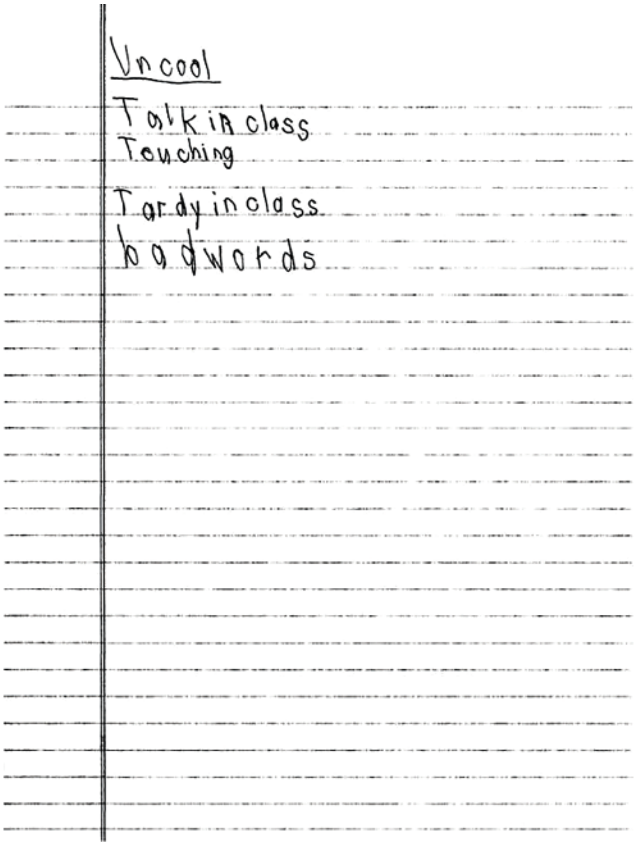
Adapting Instruction There is promising research indicating that some specific drug treatments are quite helpful (Konopasek & Forness, 2014); however, environmental supports are also important. Effective interventions must be tailored to each student's unique needs, but several strategies can benefit many of these students:

- *Show an interest in students' well-being and personal growth.* A good first step in helping students with emotional and behavioral disorders is simply showing that we care about them (Chang & Davis, 2009; Clarke et al., 1995; Heward, 2009). For example, we can greet them warmly when we see them, express concern when they seem upset or stressed, and listen when they want to share their opinions or frustrations. Moreover, we can take students' personal interests into account when planning instruction and assignments (as you'll see in Chapter 11, this will enhance intrinsic motivation).
- *Give students a sense that they have some control over their circumstances.* Some students, especially those who are frequently defiant, often respond to efforts to control them by behaving even *less* appropriately. With such students, it's important to avoid power struggles in which only one person wins and the other inevitably loses. Instead, we must create situations in which we ensure that students conform to classroom expectations yet feel that they have some control over what happens to them. For example, we can teach them techniques for observing and monitoring their own actions, with the goal of developing more productive behavior. We can also give them choices, within reasonable limits, about what tasks to accomplish or in what order (Chang & Davis, 2009; Kern et al., 1994; Lane et al., 2006; Shi & Ettekal, 2021).
- *Make sure that students are learning basic skills.* Students with emotional and behavioral disorders often are inattentive and off-task, and therefore less engaged with their academic work. Thus, these students may not develop some basic skills (e.g., basic reading or mathematical skills) that are necessary for future learning. It is important to identify these disorders early, and to work collaboratively with special educators to meet these students' social and academic needs (Nelson et al., 2014).
- *Be alert for signs that a student may be contemplating suicide.* In the United States, suicide is the third-leading cause of death for adolescents; occasionally even younger students take their own lives (CDC, 2022). Warning signs include the following:
    - Sudden withdrawal from social relationships
    - Increasing disregard for personal appearance
    - Dramatic personality change (e.g., sudden elevation in mood)
    - Preoccupation with death and morbid themes
    - Overt or veiled threats (e.g., "I won't be around much longer")
    - Actions that indicate putting one's affairs in order (e.g., giving away prized possessions) (Granello & Granello, 2006; Wiles & Bondi, 2001)

As teachers, we must take any of these warning signs seriously and seek help *immediately* from trained professionals, such as school psychologists, school social workers, or counselors. It's also essential, of course, that we help students with emotional and behavioral disorders acquire more appropriate behaviors. We describe strategies for doing so after the discussion of autism spectrum disorders in the next section.

Autism Spectrum Disorders

The central, defining features of **autism spectrum disorders** are impairments in social cognition (e.g., perspective taking, interpreting other people's body language), social skills, language usage, and social interaction. Many students with these disorders prefer to be alone and form weak, if any, emotional attachments to others. Some students develop limited abilities to use language, whereas others' language usage is more fully developed.



Uncool
Talk in class
Touching
Tardy in class
badwords

Figure 5.8 Jeremy, who has autism, writes some descriptions of what it means to be "uncool." Note that Jeremy focuses on inappropriate social interactions.

Common, too, are repetitive behaviors (often very odd ones rarely seen in age-mates) and inflexible adherence to certain routines or rituals (APA, 2000; Lord, 2010; Pelphrey & Carter, 2007; Tager-Flusberg, 2007). Autism spectrum disorders are prevalent; in the United States, an estimated 1 out of every 44 children has been identified as having autism spectrum disorder, with four times as many diagnoses in boys as in girls (CDC, 2022). Figure 5.8 represents a student with autism spectrum disorder's description of what it means to be "uncool." Notice that he focuses on social skills.

Aside from similarities in social impairments and repetitive behaviors, individuals with autism spectrum disorders differ considerably in the severity of their condition—hence the term *spectrum*. In **high functioning autism**, a fairly mild form, students usually have normal language skills and average or above-average intelligence. In severe cases, which are often referred to simply as *autism,* students have major delays in cognitive development and language and may exhibit certain bizarre behaviors—perhaps constantly rocking or waving fingers, continually repeating what someone else has said, or showing unusual fascination with a very narrow category of objects (APA, 2000; Lord, 2010).

Students with autism spectrum disorders may be either undersensitive or oversensitive to environmental stimulation (Ratey, 2001; Sullivan, 1994; Williams, 1996). Temple Grandin, who has gained international prominence as a designer of livestock facilities, recalls what it was like to be a child with autism:

> From as far back as I can remember, I always hated to be hugged. I wanted to experience the good feeling of being hugged, but it was just too overwhelming. It was like a great, all-engulfing tidal wave of stimulation, and I reacted like a wild animal. . . . When I was little, loud noises were also a problem, often feeling like a dentist's drill hitting a nerve. They actually caused pain. I was scared to death of balloons popping, because the sound was like an explosion in my ear. (Grandin, 1995, pp. 63, 67)

Autism spectrum disorders are probably caused by abnormalities in the brain. Some researchers have observed abnormalities in *mirror neurons*—neurons that probably underlie people's perspective-taking abilities (Gallese et al., 2011). Other researchers have discovered abnormalities in interconnections among various parts of the brain—for example, in connections between parts that enable logical reasoning or inhibition of impulses, on the one hand, and parts that underlie emotions and emotional processing, on the other (Cherkassky et al., 2006; Cohen, 2007; Kana et al., 2007). Some research suggests that multiple regions of the brain are involved in autism spectrum disorders (Byrnes, 2012). Autism can have genetic origins and sometimes runs in families; a child is more likely to have autism if a sibling also has it (CDC, 2021; DiGuiseppi et al., 2010; Talkowski et al., 2014). Although some have suggested that autism may be caused by childhood vaccines, there is *no* evidence that there is any association of vaccines with autism (Institute of Medicine, 2011; Jain et al., 2015; Maglione et al., 2014).

Common Characteristics In addition to the traits already described, students with autism spectrum disorders may have characteristics such as these:

- Strong visual–spatial thinking skills and exceptional awareness of visual details
- Unusual ability to maintain attention and focus during distractions
- Difficulty understanding how other people feel

- Good memory for a set of unrelated facts
- May avoid physical contact with others or making eye contact
- Difficulty planning and organizing a future course of action or adapting to changes in routine
- Strong need for a consistent, predictable environment (CDC, 2017b, 2021; Cohen, 2007; Dawson et al., 2007; Gernsbacher et al., 2008; Grandin & Johnson, 2005; Lord, 2010; Meltzer, 2007; Pelphrey & Carter, 2007; Tager-Flusberg, 2007)

Occasionally students with autism exhibit *savant syndrome*—that is, possessing an extraordinary ability (e.g., exceptional mathematical, artistic, or musical talent) that is quite remarkable in contrast to other aspects of their mental functioning (Cohen, 2007; Heaton & Wallace, 2004; Miller, 2005; Treffert & Wallace, 2002).

The term *Asperger syndrome* used to be used to describe a mild form of autism, but that term is no longer common.

Adapting Instruction Students with high functioning autism are typically in general education classes. Students with more severe autism also can sometimes participate in general education classes for all or part of the day, although inclusion of these students can be complex, so the support of a special educator often may be necessary (Crosland & Dunlap, 2012). As with other exceptionalities, it is important to include parents in discussions about the most appropriate setting for their children. The mother of a first grader with autism, who advocated for her son to be in a classroom that also had non-special-education students, noted that "If he was in a program that was just with other autistic children, there would be no way for him to pick up the behaviors of typically developing children" (Crane, 2010).

Many of the classroom strategies described in earlier sections are applicable for such students. Two additional strategies are helpful as well:

- *Maximize consistency in the classroom layout and weekly schedule.* Many students with autism spectrum disorders feel more comfortable when their environments and schedules are predictable. At the beginning of the year, we should arrange furniture and equipment in ways that will be consistent throughout the school year, making adjustments later only if absolutely necessary. To the greatest extent possible, we should schedule recurring activities at the same times each day or on particular days of the week. If the schedule must change for some reason, we should alert students well in advance (Dalrymple, 1995).
- *Use visual approaches to instruction.* Because students with autism spectrum disorders often have strong visual–spatial skills but may have impaired language skills, a heavy emphasis on visual materials may be helpful (Hanley et al., 2017; Ozonoff & Schetter, 2007; Peterson, 2002; Quill, 1995). We might use objects, pictures, graphic organizers, and photographs to convey ideas about academic topics, or utilize some sort of visual cue to signal the start of a new activity (Finnegan & Mazin, 2016).

General Recommendations

Although the causes of emotional and behavioral disorders and those of autism spectrum disorders are usually quite different, students with these disabilities can benefit from some of the same classroom interventions. Following are some suggestions:

- *Insist on appropriate classroom behavior.* Although certain students with disabilities may be more prone to counterproductive behaviors than their peers, teachers *can* help them behave in productive ways—for instance, by putting reasonable limits on their behavior and imposing consequences when they go beyond those limits (Evertson & Weinstein, 2006; Webber & Plotts, 2008). The Creating a Productive Classroom Environment feature "Encouraging Appropriate Behavior in Students with Social or Behavioral Problems" offers several useful strategies.

Creating a Productive Classroom Environment

Encouraging Appropriate Behavior in Students with Social or Behavioral Problems

- **Make expectations for behavior clear and specific.**

  A teacher reminds a student, "You can't borrow Carrie's bottle of glue without getting her permission. Check with Carrie first to make sure it's all right for you to use her things. If Carrie says no, ask someone else."

- **Specify and follow through on consequences for appropriate and inappropriate behaviors.**

  A teacher tells a student, "Sam, you know that certain four-letter words, such as the two you just used, are unacceptable in this classroom. You also know the consequence for such behavior, so please go to the time-out corner for 10 minutes."

- **Give feedback about specific behaviors rather than general areas of performance.**

  A teacher tells a student, "You did a good job in study hall today. You focused your attention on your homework, and you didn't retaliate when Matt accidentally brushed past you on his way to my desk."

- **Try to anticipate problems and address them immediately.**

  A student has occasional temper tantrums that disrupt the entire class. Although the tantrums seemingly occur at random, his teacher eventually realizes that his ears always turn red just before an outburst. With this knowledge, she can divert the student's attention to a punching bag whenever a tantrum is imminent, thereby letting him unleash his feelings with only minimal distraction to others.

SOURCES: Hallahan et al., 2009; Heward, 2009; Myles & Simpson, 2001; Ormrod & McGuire, 2007 (temper tantrum example); Webber & Plotts, 2008.

- *Foster social cognition and effective interpersonal skills.* Students with social or behavioral problems often benefit from training in social cognition and perspective taking. Explicit instruction in and reinforcement of social skills can also be quite powerful. And of course, students need numerous opportunities to *practice* their new skills (e.g., Chan & O'Reilly, 2008; Myles & Simpson, 2001; Nikopoulos & Keenan, 2004; Schrandt et al., 2009; Theimann & Goldstein, 2004).
- *Be persistent and look for gradual improvement rather than overnight success.* Many students with social or behavioral problems will initially resist our efforts to help them. They may begin to recognize the value of our guidance and support when they see the natural benefits of their changing behavior—for example, when they start to make new friends or get along better with their teachers. Their progress may be slow, but by focusing on small improvements, we and our students alike can be encouraged by the changes we *do* see, rather than being discouraged by problems that persist.

You can find strategies for fostering social cognition and perspective taking in Chapter 3.

Students with General Delays in Cognitive and Social Functioning

When we use the term *student with general delays in cognitive and social functioning,* we're talking about any student who shows a consistent pattern of developmental delays, regardless of whether the student has been identified as having a disability. A student with especially pronounced difficulties may be identified as having an intellectual disability.

Intellectual Disabilities

The term **intellectual disability** refers to students who show pronounced delays in most aspects of cognitive and social development. More specifically, students with intellectual disabilities exhibit *both* of the following characteristics (Luckasson et al., 2002):

- *Significantly below-average general intelligence.* These students learn slowly and show consistently poor achievement in virtually all academic subject areas. They generally have intelligence test scores that are quite low—usually no higher than 70, reflecting performance in the bottom 2% of their age-group. However, there is controversy regarding strict cutoffs on these scores, given the previously discussed concerns about assessing intelligence (Greenspan & Olley, 2015).

- *Deficits in adaptive behavior.* These students behave in ways that we would expect of much younger children. Their deficits in **adaptive behavior** include limitations in *practical intelligence*—managing the ordinary activities of daily living—and *social intelligence*—conducting themselves appropriately in social situations. Although students with intellectual disabilities experience difficulties in most or all parts of the curriculum, many of these students are sociable and eager to fit in at school. To be considered an intellectual disability, these characteristics must be evident in childhood. Thus, a person who shows them beginning at age 18, perhaps as the result of a serious head injury, would *not* be classified as such.

There are three levels of intellectual disabilities. Students who have a *mild to moderate intellectual disability* generally are able to learn how to take care of themselves; they usually can travel and often can be employed. Children or adolescents with a *severe intellectual disability* experience major delays in development and require a great deal of support; they often can understand speech but may have difficulty producing speech. Individuals with a *profound intellectual disability* experience severe cognitive impairment; they often also have severe physical limitations and require extensive care (National Academy of Sciences, 2015).

Intellectual disabilities are often caused by genetic conditions. For example, most children with Down syndrome have delayed cognitive and social development. Other cases are due to biological but noninherited causes, such as severe malnutrition or excessive alcohol consumption during pregnancy or oxygen deprivation during birth. In other situations, environmental factors, such as parental neglect or an extremely impoverished and unstimulating home environment, may be the cause (Beirne-Smith et al., 2006).

Common Characteristics Like students in any category of special needs, students with intellectual disabilities have differing personalities, strengths, and needs. Nevertheless, many of them are apt to exhibit characteristics such as the following:

- Sociability and a genuine desire to belong and fit in at school
- Less general knowledge about the world
- Poor reading and language skills
- Short attention span
- Poor memory; few or no effective learning and memory strategies
- Difficulty drawing inferences and understanding abstract ideas
- Difficulty generalizing something learned in one situation to a new situation
- Immature play behaviors and interpersonal skills
- Delayed motor skills; conditions that adversely affect performance in physical activities (e.g., heart defects, poor muscle tone) (Beirne-Smith et al., 2006; Bergeron & Floyd, 2006; Carlin et al., 2003; Heward, 2009; F. P. Hughes, 1998; Tager-Flusberg & Skwerer, 2007)

Adapting Instruction With proper support, many students with mild intellectual disabilities can learn basic skills in reading, writing, and math, perhaps even mastering components of a typical fifth- or sixth-grade curriculum (Hallahan et al., 2009; Heward, 2009). Many special programs also are available for students with mild intellectual disabilities, sometimes involving partnerships with local universities (Nephin, 2014). Most of the strategies previously described in this chapter can be useful for these students. Here are several additional strategies to keep in mind:

- *Pace instruction slowly and set short-term goals to ensure success.* When working with a student who has an intellectual disability, we should move through new topics and tasks systematically and slowly enough—and with enough support and repetition—so that the student can eventually master them. Students with intellectual disabilities typically have a long history of failure at academic tasks. Thus, they need frequent success experiences to learn that, with hard work, they *can* succeed at many tasks. By setting short-term, easy-to-reach goals, students will be more likely to experience success, and be motivated to continue to engage in similar activities (Drasgow et al., 2017; Feuerstein et al., 2010; Fidler et al., 2005; Heward, 2009; Sands & Wehmeyer, 2005).

- *Provide scaffolding to promote effective cognitive processes and desired behaviors.* We can develop simple study guides that tell students exactly what to focus on as they study. We can be explicit in our directions to perform various tasks—for instance, saying "Paul, go to the office, give Mrs. Logan the absentee sheet, and come back here." And we can provide handheld, teacher-programmed prompters—which go by such labels as *visual assistant* and *digital memory aids*—to help students remember the things they need to do (Beirne-Smith et al., 2006; Mastropieri & Scruggs, 1992; Patton et al., 1996, p. 105; Turnbull et al., 2010).
- *Include vocational and general life skills in the curriculum.* For most students with intellectual disabilities, training in life and work skills is an important part of the high school curriculum. Such training is most likely to be effective when it takes place in realistic settings that closely resemble those in which students will find themselves once they leave school (Beirne-Smith et al., 2006; Turnbull et al., 2010). One successful program provides opportunities for adolescents to learn a variety of farming and farm-related skills. Participants learn about planting, harvesting, and even the retail aspects of farming, including opportunities to sell produce at the farm's store (Bacon, 2014). The students report that they enjoy these opportunities, and the acquisition of these skills often leads to future employment.

Students with Physical or Sensory Challenges

Some students with special needs have physical disabilities caused by medically detectable physiological conditions, including physical and health impairments, visual impairments, and hearing loss. A small subset have **severe and multiple disabilities** that require significant adaptations and highly specialized services; such students are typically accompanied by child-specific teacher aides or other specialists when attending general education classrooms.

Physical and Health Impairments

Physical and health impairments are general physical or medical conditions (usually long term) that interfere with school performance to such a degree that special instruction, curricular materials, equipment, or facilities are necessary. Students in this category may have limited energy and strength, reduced mental alertness, or little muscle control. Examples of conditions that might qualify students for special services are traumatic brain injury, spinal cord injury, cerebral palsy, epilepsy, cancer, and acquired immunodeficiency syndrome (AIDS).

Kathryn Kirkpatrick, a social worker who works with children and adolescents who are being treated for cancer, describes what she believes all teachers should know:

> While teachers are often anxious about meeting the needs of a child who is a cancer survivor, there is such relief at seeing a healthy child back in the classroom that subtle learning difficulties can be overlooked. Cognitive late effects related to treatment for childhood cancer can emerge as long as 3–5 years after treatment has been completed and are dependent on the type of treatment received. Common learning

difficulties to emerge are executive function deficits, impulsivity, memory loss, and slowed processing speed. Because these issues can present in ways that look like disorganization, procrastination or work refusal, it is important for teachers to understand the risks for these students and have a low threshold for referral to special education or 504 evaluation. Teachers should have the same high academic expectations for childhood cancer survivors that they have for other students, while also understanding that some of the survivors may need support to produce high quality work.

Common Characteristics It's hard to generalize about students with physical and health impairments because their conditions are so very different from one another. Nevertheless, several common characteristics are noteworthy:

- Low stamina and a tendency to tire easily
- Varying degrees of intellectual functioning (many of these students have learning ability similar to that of nondisabled peers); occasionally students' intellectual functioning may be temporarily impaired, particularly if the child underwent chemotherapy
- Lower levels of academic achievement as a result of frequent absences
- Fewer opportunities to experience and interact with the outside world (e.g., less use of public transportation; fewer visits to concerts, museums, and zoos)
- Possible low self-esteem, insecurity, social isolation from peers, or heavy dependence on adults, depending partly on how parents and others have responded to their impairments (American Cancer Society, 2017; Heward, 2009; Patton et al., 1996; Wood, 1998; Yeo & Sawyer, 2005)

Adapting Instruction Although we won't necessarily need to modify the curriculum for students with physical and health impairments, we will definitely want to make certain accommodations:

- *Be sensitive to specific limitations and accommodate them flexibly.* One student may require extra time with a writing assignment and perhaps should not be held to the same standards of neatness and legibility, whereas another may need to respond to test questions orally rather than on paper.
- *Know what to do in emergencies.* A student with acute asthma may have trouble breathing; a student with diabetes may go into insulin shock; a student with epilepsy may have a grand mal seizure. We should make sure we know how to respond, ahead of time, so that we are prepared to do so calmly and appropriately in such life- and health-threatening situations.
- *If students and parents give permission, educate classmates about the nature of students' challenges.* Many children treat peers with physical disabilities kindly and respectfully, but some others do not. Sometimes peers are simply ignorant about the nature of a disability, and giving them accurate information can help them become more accepting and supportive (e.g., White & Cunningham, 1991).

Visual Impairments

Students with **visual impairments** have malfunctions of their eyes or optic nerves that prevent normal vision even with corrective lenses. Some students are totally blind, others see only fuzzy patterns of light and dark, and still others have a restricted visual field (*tunnel vision*) that allows them to see just a very small area at a time. Visual impairments are caused by congenital abnormalities in or damage to either the eye or the visual pathway to the brain. Vision is essential to the development of many cognitive abilities, including reading from print, understanding spatial relationships, and comprehension of concepts (Smith et al., 2016). When students have visual impairments, these abilities may be delayed, and that could affect learning in all academic subjects.

Common Characteristics Students with visual impairments may have many or all of these characteristics:

- Normal functioning of other senses (hearing, touch, etc.)
- General learning ability similar to that of nondisabled students, although visual memory and concept development may be delayed or impaired
- More limited vocabulary, expressive and receptive language, and general world knowledge, in part because of fewer opportunities to experience the outside world in educationally important ways (e.g., less exposure to maps, films, and other visual material)
- Delayed motor development; reduced capability to imitate others' behaviors
- Inability to observe other people's body language and other nonverbal cues, leading to occasional misunderstanding of others' messages and immature social behaviors
- Uncertainty and anxiety (especially in chaotic environments, such as the lunchroom or playground) because of having no visual knowledge of ongoing events
- In the primary grades, less knowledge about the conventions of written language (direction of print, punctuation, etc.) (Harris, 1992; Heward, 2009; Hobson, 2004; Patton et al., 1996; Smith et al., 2016; Tompkins & McGee, 1986; Turnbull et al., 2010; Tuttle & Tuttle, 1996)

Adapting Instruction Specialists typically give students training in Braille, orientation and mobility, and specially adapted computer technology. But general education teachers play important roles as well, as reflected in the following strategies:

- *Orient students ahead of time to the physical layout of the classroom.* Students should have a chance to explore the classroom before other students arrive—ideally, before the first day of class. At that time, we can help students locate important objects (e.g., trash can and pencil sharpener) and point out special sounds (e.g., the buzzing of a wall clock) to help students get their bearings (Wood, 1998). We also need to support students when furniture or objects in the classroom are moved to new locations. Partner with special educators; some are trained in supporting students with visual impairments with both orientation and mobility issues. Computer-generated virtual environments that can be created and presented to individuals prior to their immersion in a new environment are now available. The use of such software can improve navigation skills (Connors et al., 2014).
- *Use visual materials with sharp contrast.* Some students with partial sight can use visual materials with clearly distinguishable features, such as enlarged documents on computer screens and the large-print books available at most libraries. Students' eyes may tire quickly, however, so we should limit use of visual materials to short time periods (Heward, 2009; Patton et al., 1996).
- *Depend heavily on other modalities.* Print-reading software and portable print-reading devices easily translate most printed text into spoken language. Many novels, textbooks, and published curricular materials are available in Braille, many other books are available in audio form (e.g., see www.learningally.org), and volunteers can sometimes be enlisted to convert other written materials into Braille or audio. We can also conduct hands-on activities involving objects that students can feel and manipulate, and we can involve students in projects that involve oral presentations. For example, we might use plastic relief maps that portray mountains, valleys, and coastlines in three dimensions, perhaps embellishing them with pinpricks to indicate country borders and small dabs of nail polish to indicate major cities.
- *Allow extra time for learning and performance.* Learning by hearing often takes more time than learning by seeing. When students *look* at something, they perceive a great deal of information at once and thus learn many commonplace relationships (e.g., between the sight of a cat and the sound it makes). When they must *listen* to it, however, they receive it sequentially—only one piece at a time—and often without

obvious interconnections (Ferrell, 1996; Heward, 2009; Rowe, 1978). When students can't see various objects and diagrams, their ability to process information is not used to its full potential (Mayer, 2014).

- *Teach learning strategies to your students.* Visually impaired students in particular can benefit from explicit instruction in various strategies (Smith et al., 2016). Whereas other students can acquire some of these strategies through observation, visually impaired students will need extra support in learning many strategies. In addition, some strategies (e.g., highlighting important text while reading) will not be possible for students with severe visual impairments; nevertheless, alternative strategies often are available. Collaborative partnerships with special educators are particularly beneficial in these situations.

Hearing Loss

Students with **hearing loss** have a malfunction of the ears or associated nerves that interferes with the perception of sounds within the frequency range of normal human speech. Two to three of every 1,000 children born in the United States have detectable hearing loss at birth (National Institute on Deafness and Other Communication Disorders, 2014). Students who are completely *deaf* have insufficient sensation to understand any spoken language, even with the help of a hearing aid. Students who are *hard of hearing* understand some speech but experience exceptional difficulty in doing so.

Common Characteristics Some members of the hearing loss community do not view hearing loss as a disability. Instead, they consider their community as a culturally distinct group of individuals who share common experiences and often share a common language. There are some schools that are designed for students with hearing loss (Hallahan et al., 2019). Most students with hearing loss have normal intellectual abilities (Braden, 1992; Schirmer, 1994). However, they may have characteristics such as the following:

- Delayed language development because of reduced exposure to spoken language, especially if the impairment was present at birth or emerged early in life
- Proficiency in sign language, such as American Sign Language (ASL) or finger spelling
- Some ability to read lips (*speechreading*) and/or facial expressions
- Less oral language than that of hearing classmates, particularly if loss of hearing is congenital or occurred very early in life; perhaps a monotonous, hollow quality to speech
- Less developed reading skills, especially if language development has been delayed
- Less general world knowledge because of reduced exposure to spoken language
- Below average academic achievement
- Some social isolation, more limited social skills, and reduced perspective-taking ability as a result of a reduced ability to communicate (American Speech Language Hearing Association, 2015; Bassett et al., 1996; Chall, 1996; Harris, 2006; Heward, 2009; Peterson, 2002; Qi & Mitchell, 2012; Rowe, 1978; Schick et al., 2007; Turnbull et al., 2010).

Adapting Instruction Dr. Peter Paul is a researcher who has spent his career focusing on improving educational outcomes for children with hearing loss. Dr. Paul notes that:

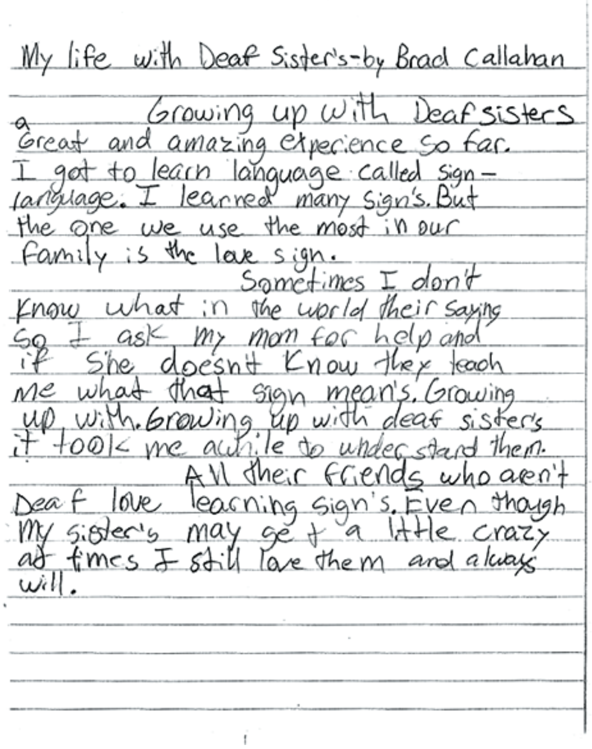
> Children with hearing loss exhibit diverse characteristics with respect to achievement (academic and social) and communication (sign and/or speech). Major challenges for educators involve the teaching of children with severe to profound hearing loss, especially those who are predominantly dependent on signing for receptive and expressive communication. The majority of children with hearing

loss use speech, particularly English, as their primary form of communication. A large minority use a combination of speech and sign in English and only a small percentage (fewer than 10%) use a sign language such as American Sign Language. In the United States, there has been an evolving cohort such that a large number of children are beginning their formal education period wearing either advanced digital hearing aids or cochlear implants. Most children with hearing loss up to the severe level should be able to participate in the general education classroom and curriculum, albeit some children will need varying levels of support (e.g., notetakers, oral or sign interpreters).

Specialists typically provide training in such communication skills as American Sign Language, finger spelling, and speechreading, as needed. With these additions (and possibly some remedial instruction in reading and vocabulary), a normal school curriculum is appropriate for most students with hearing loss. However, several accommodations can facilitate students' success in general education classrooms:

- *Minimize irrelevant noise.* Even when students can benefit from hearing aids, what they hear is often diminished or distorted; consequently, it's helpful to minimize potentially distracting sounds within the classroom.
- *Supplement auditory presentations with visual information and hands-on experiences.* We can write important points on the board, illustrate key ideas with pictures, provide reading materials that duplicate lectures, and ask an aide or student volunteer to take notes. We can also provide speech-to-text software, which enables students to translate spoken words into written language with reasonable accuracy. And we can use concrete activities (e.g., role-playing historical events) to make abstract ideas more understandable.
- *Communicate in ways that help students hear and read speech.* Students who are hard of hearing are most likely to understand us when we speak in a normal tone of voice (not overly loud) and pronounce words distinctly but otherwise normally. We should avoid using generic words like "this" or "that" to refer to objects in the classroom and, to help students read speech, we should speak only while facing them and never while sitting in a dark corner or standing in front of a window or bright light. In Figure 5.9, Brad discusses what it is like to live with his deaf sisters; notice how he has learned to facilitate communication with them over time (Gearheart et al., 1992; Technological Education Center for Deaf and Hard-of-Hearing Students, 2018; Wood, 1998).

Figure 5.9 Brad describes life with his two deaf sisters.



My life with Deaf Sister's-by Brad Callahan

Growing up with Deaf sisters
a Great and amazing experience so far.
I got to learn language called sign-
language. I learned many sign's. But
the one we use the most in our
family is the love sign.
Sometimes I don't
know what in the world their saying
so I ask my mom for help and
if she doesn't know they teach
me what that sign mean's. Growing
up with. Growing up with deaf sister's
it took me awhile to understand them.
All their friends who aren't
Deaf love learning sign's. Even though
my sister's may get a little crazy
at times I still love them and always
will.

General Recommendations

In addition to the strategies just identified for specific physical disabilities, several more general strategies are useful with all students who have physical or sensory challenges:

- *Ensure that all students have access to important educational resources and opportunities.* Such access may involve modifying instructional materials (e.g., obtaining large-print copies of textbooks), adjusting a classroom's physical arrangement (e.g., widening aisles and placing bulletin board displays at eye level to accommodate students in wheelchairs), or making special arrangements that enable students to participate in field trips or sports activities.
- *Provide assistance only when students really need it.* Out of their eagerness to help students with physical and sensory challenges, many adults inadvertently perform tasks and solve problems that these students can handle on their own. One

of our goals for these students should be to promote their independence, not their dependence on others (Wehmeyer et al., 2007).

- *Use assistive technology to facilitate learning and performance.* We've already mentioned the value of print-reading software and speech-to-text software for students with sensory challenges. In addition, some computer printers can create Braille documents, enabling students with visual impairments to read their own class notes and compositions. Specially adapted joysticks and voice recognition systems can supplement or replace keyboards for students with limited muscle control. Finally, machines known as *augmentative communication devices* provide synthesized speech for students incapable of producing normal speech.

Students with Advanced Cognitive Development

Learning Objective 5.5 Explain how you might nurture the development of students who show exceptional gifts and talents.

Many students have advanced abilities, either in specific subject areas or across the curriculum, that warrant attention and encouragement. Some students—those who are *gifted*—are so far above the norm that special educational services are often appropriate. We will encounter gifted students in our classes quite often; as we'll see, there are numerous considerations in adapting instruction to engage and challenge gifted students.

Giftedness

In general, **giftedness** is unusually high ability or aptitude in one or more areas (e.g., in math, science, creative writing, music) to such a degree that special educational services are necessary to help these students meet their full potential. In most instances, giftedness is probably the result of both a genetic predisposition and environmental nurturing (Dai, 2010; Simonton, 2001; Winner, 2000b). In some cases, however, special gifts and talents are largely the result of intensive practice and mentoring (Ericsson, 2003; Gladwell, 2006). The emergence and development of these talents also is enhanced when there is ample family support and encouragement (Olszewski-Kubilius et al., 2018).

The identification of a child as gifted is often a reflection of the values of one's society. Thus, a student who is gifted in sculpting might not be identified as such in a community in which sculpting (or art, more generally) is not valued (Subotnik et al., 2011). When students are recommended by teachers for participation in gifted programs, their likelihood of being recommended may be affected by irrelevant factors. In many cases, students are identified for gifted programs based on academic achievement or test scores. Black and Hispanic/Latino/a/x students are underrepresented in gifted education programs, often because they are not referred by school personnel (Ford et al., 2021). As educators, we need to consider broad criteria when recommending students for gifted programs, and in particular we need to keep in mind cultural biases in measures of intelligence, discussed earlier. We also need to align selection criteria for gifted programs with the actual curricula being offered. For example, if a program that is called a "gifted education" program is really just an opportunity to take advanced mathematics courses, then selection criteria should probably be based on math achievement (e.g., Rothenbusch et al., 2016).

Giftedness is not included in IDEA. In the United States, the Jacob K. Javits Gifted and Talented Student Education Act of 1987 (reauthorized in 1994, 2001, and in 2015 as part of the Every Student Succeeds Act) encourages but doesn't necessarily mandate special educational services for students who are gifted. Many state governments also either encourage or mandate such services. School districts often use multiple criteria—sometimes including intelligence test scores, sometimes not—to identify students who show exceptional promise in general academic ability, specific academic fields, creativity, or the arts. A current debate is whether the goal of gifted education should be to develop eminence and talent, or to provide opportunities for students to develop newly emerging talents (Subotnik & Rickoff, 2010; Subotnik et al., 2017).

Common Characteristics Students who are gifted vary considerably in their unique strengths and talents, and those who show exceptional talent in one area may have only average ability in another (Winner, 2000b). Nevertheless, many students who are gifted have characteristics such as these:

- Advanced vocabulary, language, and reading skills
- Extensive general knowledge about the world
- Ability to learn more quickly, easily, and independently than peers
- Advanced and efficient cognitive processes and learning strategies
- Considerable flexibility in ideas and approaches to tasks
- High standards for performance (sometimes to the point of unhealthy perfectionism)
- High motivation to accomplish challenging tasks; boredom during easy tasks
- Strong interest in the area in which strengths have been identified
- Average or above-average social and emotional adjustment. A common myth is that participation in gifted programs may lead to long-term social or emotional problems; this is not correct. Gifted students do not experience excessive problems with psychological adjustment later in life, although a few extremely gifted students may have difficulties in school because they are so *very* different from their peers.
- Positive self-concept, especially with regard to academic endeavors (although they also often have lower self-perceptions regarding their appearance and athletic abilities). (Bernstein et al., 2021; Dai, 2010; Litster & Roberts, 2011; Mendaglio, 2010; Parker, 1997; Shavinina & Ferrari, 2004; Steiner & Carr, 2003; Subotnik et al., 2011; Subotnik et al. 2012; Winner, 2000a, 2000b)

To some degree, the nature of giftedness depends on where students are in their developmental journeys (Dai, 2010; Matthews, 2009). In the preschool and early elementary years, giftedness might take the form of precociousness in certain general domains; for example, a first grader might be reading sixth-grade-level books or exhibit exceptional facility with numbers. By the upper elementary and secondary grades, some students are likely to show exceptional achievement in very specific areas—perhaps in creative writing or music. Yet we must keep in mind that students who are gifted may also have one or more disabilities. In planning instruction for such students, we must address their disabilities as well as their unique gifts.

Adapting Instruction Exceptional talents and achievement levels typically require ongoing environmental nurturance and support, in the form of both differentiated instruction and access to appropriate resources and practice opportunities. Furthermore, many high-achieving students become bored or frustrated when assignments don't challenge them, and others become so accustomed to the "easy A" that they have trouble coping with the mistakes they're likely to make when they venture into new areas (Dai, 2010; Mendaglio, 2010; Parker, 1997). With such points in mind, we offer the following recommendations:

- *Provide individualized tasks and assignments.* Different students need special services in very different areas—for example, in math, creative writing, or art. Some students who are gifted, especially those with only a limited background in English, may also need training in certain basic skills (Harris, 1991; Udall, 1989).

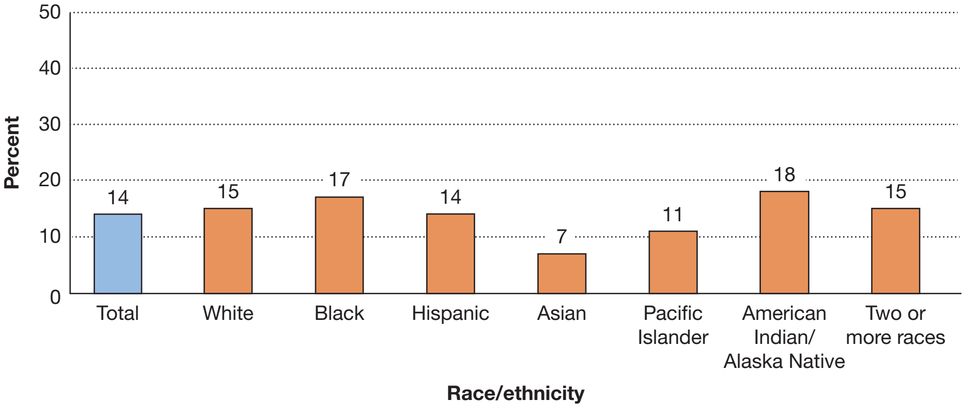
- *Form study groups of students with similar interests and abilities.* In some cases, a study group might explore a topic in greater depth and with more sophisticated analysis than other students (an *enrichment* approach); in other instances, a study group might simply move through the standard school curriculum at a more rapid pace (an *acceleration* approach) (Worrell et al., 2019). Enrichment and acceleration are both beneficial for gifted students, and they are not mutually exclusive— courses can potentially be accelerated and enriching simultaneously (Rogers, 2002; Subotnik et al., 2011). Students benefit both academically and socially from increased contact with peers who have similar interests and talents (Hattie, 2009; Kulik & Kulik, 1997; McGinn et al., 1980).
- *Teach complex cognitive skills within the context of specific subject areas.* Programs designed to enhance students' creativity, critical thinking, or other complex skills separately from specific content domains tend to have only limited impact. Teaching complex thinking skills within the context of specific topics—for example, creativity in writing or reasoning and problem-solving skills in science—is more likely to be effective (Dai, 2010; Linn et al., 1989; Moon et al., 1994; Stanley, 1980).
- *Provide opportunities for independent study and service-learning projects.* Independent study and community service projects in areas of interest are often beneficial and motivating for high-ability students, provided they have the work habits, study strategies, and research skills they need to use their time and resources effectively (Candler-Lotven et al., 1994; Terry, 2008). However, even if students are working on projects of this nature, it is important that gifted students have clear goals and are provided with continuous feedback as they progress toward these goals (Callahan et al., 2015).
- *Seek outside resources.* When students have high abilities in domains outside our areas of expertise, it's helpful to identify mentors elsewhere in the school district or in the community—perhaps at a local university, government office, business, or volunteer community group (Ambrose et al., 1994; Piirto, 1999; Subotnik et al., 2020).
- *Keep in mind that students with exceptional cognitive abilities aren't necessarily advanced in other aspects of their development.* Most students with special gifts and talents have the same personal and emotional concerns as their average-ability age-mates (Matthews, 2009). For example, gifted sixth graders making the transition to middle school are likely to have the typical thoughts and feelings of a young adolescent: whether they'll fit in with a new peer group, whom to sit with at lunch, and so on. They may worry that their peers will see their exceptional ability levels as odd or in some other way unacceptable (Mendaglio, 2010). And they're likely to be surprised or anxious when they discover that they must exert considerable effort to master challenging new skills and that they sometimes make errors in the process (Mendaglio, 2010). For such reasons, high-ability students are likely to need as much emotional support as their classmates. They may occasionally need gentle reminders that only new challenges can truly help them grow and that new skills require practice, regardless of innate levels of ability.

Working with a mentor often takes the form of a cognitive apprenticeship (see Chapter 2).

Considering Diversity When Identifying and Addressing Special Needs

A disproportionately large number of ethnically diverse students are identified as having disabilities, especially specific cognitive disabilities, general intellectual disabilities, and emotional and behavioral disorders (McLoyd, 1998; National Center for Education Statistics, 2022; VanTassel-Baska, 2008). Figure 5.10 displays the percentages of youth receiving services under IDEA, broken down by race/ethnicity. Many theorists attribute

Figure 5.10 Percentage of students ages 3 to 21 by race/ethnicity served under the Individuals with Disabilities Education Act (IDEA), 2019-20 school year.



NOTE: Data are based on the total enrollment in public schools, prekindergarten through 12th grade.

SOURCE: Institute of Education Sciences/NCES, downloaded from: https://nces.ed.gov/programs/coe/indicator/cgg

these differing identification rates to environmental conditions that often accompany low socioeconomic status: higher-than-normal exposure to environmental toxins, poor nutrition, inadequate medical care, and limited access to enriching educational resources (e.g., Dyson, 2008; Jacoby & Glauberman, 1995; McLoyd, 1998). In addition, English language learners are identified as having learning disabilities or intellectual disabilities more often than native English speakers—a finding that probably reflects students' difficulty in understanding and responding to items on language-based diagnostic tests (Sullivan, 2008).

The higher-than-average identification rates for ethnically diverse students pose a dilemma for educators. On the one hand, we don't want to assign a label such as *intellectual disability* or *emotional disorder* to students whose classroom performance and behavior may be due to their challenging living conditions; on the other hand, we don't want to deprive these students of special educational services that might help them learn and achieve more successfully. In such situations, we must conduct fair and nondiscriminatory evaluations of students' needs, and if students qualify under a special-needs category, we must create IEPs to meet those needs. We should consider these categories of special needs as *temporary* classifications that may no longer be applicable as students' classroom performance improves. *All* students, with and without disability classifications, have changing needs that evolve over time, and federal law requires that IEPs be revisited at least once a year.

Especially when working with students identified as having cognitive, emotional, or behavioral difficulties, think of their disability labels as *temporary* classifications that may no longer be applicable as classroom performance improves.

In addition to being overrepresented in programs for students with disabilities, keep in mind that members of some cultural and ethnic groups are underrepresented in programs for gifted students (Ford, 2012, 2014; Graham, 2009; VanTassel-Baska, 2008). Furthermore, when students from underrepresented groups are identified for participation in gifted education programs, teachers often need to mentor and monitor these students carefully to encourage them to remain in these programs (Moore et al., 2011). On average, students from underrepresented cultural and ethnic groups are at a disadvantage when traditional tests of ability are used to identify giftedness—in some cases because they have had little experience with the kinds of tasks that appear on those tests (Rogoff, 2003). It's critical, then, that we be on the lookout for other signs of giftedness, including the following:

- Exceptional talent in a specific area
- Ability to learn quickly from experiences
- Exceptional communication skills (e.g., articulateness, richness of language)
- Originality and resourcefulness in thinking and problem solving
- Ability to generalize concepts and ideas to new, seemingly unrelated situations (Dai, 2010; Haywood & Lidz, 2007; Winner, 1996)

Look beyond IQ scores in identifying students who may be gifted; for instance, look for specialized talents, richness of language, an ability to learn new things quickly, musical or artistic talents, and exceptional resourcefulness in solving problems.

For the growth of our society over the long run, it's imperative that we nurture the many gifted students in *all* cultural and ethnic groups.

General Recommendations for Working with Students Who Have Special Needs

Although students with special educational needs vary widely in their abilities and disabilities, several recommendations apply across the board:

Chapter 14 and Chapter 15 offer numerous suggestions for accommodating disabilities in assessments.

- *Be flexible in approaches to instruction and assessment.* Even when students clearly fall within a particular category of special needs, we can't always predict which instructional methods will be most effective for each of them. If we don't succeed with a particular approach, we should try again, but we might also want to try *differently*. Some Internet resources provide access to materials designed to support the learning of students with a wide range of disabilities (e.g., https://aem.cast.org/). Furthermore, we must keep open minds about how we assess achievement; depending on the nature of students' disabilities, we may need to give them extra time, let them record their responses, or tailor assessment tasks to an individualized curriculum (Royer & Randall, 2012).
- *Seek new technologies that can facilitate students' learning and performance.* As we've seen, assistive technology takes a wide variety of forms—spell checkers, handheld prompters, speech-to-text software, and so on—and exciting new technologies emerge every year. Software also is becoming readily available so that students with disabilities can work with technology that is now fairly common in schools, such as iPads (Chai et al., 2015). Virtual reality also has great potential for use supporting students with special needs. One middle school provided students who volunteered to be videographers with 360-degree cameras to help create a virtual tour of the school. They created a virtual environment for new students transitioning into the school, with the goal of enabling students with disabilities (as well as other students) to explore the school environment and learn their way around prior to the start of the new school year (García Mathewson, 2019).
- *Design instruction so that it is broad enough to meet the needs of all students.* **Universal design** is a principle that allows for flexibility in how information is presented, and how students demonstrate what they have learned; the central tenet of universal design is that instructional materials should be designed so that there are as few barriers as possible to students using those materials (King-Sears, 2009; Ralabate, 2011). When educators incorporate principles of universal design, they consider the full range of students who might engage with the materials being developed. Materials are then written and organized from the start so that they can be used by as many students as possible. An example of an application of universal design is the development of an educational software package that is designed from the start to accommodate learners who might experience difficulties; thus, the software might be designed so that it provides appropriate directions for use, as well as feedback and guidance for learners who use the software incorrectly or who need to repeat various activities (Darrow, 2010).
- *Unless there is reason to do otherwise, hold the same expectations for students with disabilities as for other students.* Sometimes a disability makes it difficult or impossible for students to accomplish certain tasks, and we have to modify our expectations and assessment practices. Aside from such situations, however, we should generally have the same expectations for students with special needs that we have for

other students. Rather than think of reasons that a student *can't* do something, we should think about how we can help the student *do* it. Try to discourage students with disabilities from comparing themselves to other students, as this can have a negative effect on their motivation and self-concept (Kocaj et al., 2018). When partnering with a special educator, both the classroom teacher and the special educator need to hold similar high expectations, while simultaneously partnering to provide appropriate supports for the student.

- *Identify and teach the prerequisite knowledge and skills students may not have acquired because of their disabilities.* As either a direct or indirect result of certain disabilities, some students lack the knowledge and skills essential for school success. For instance, students with visual impairments haven't been able to observe many of the cause-and-effect relationships that form a foundation for learning science—such as the changes in the appearance of wood when it's burned (Ferrell, 1996; Rowe, 1978). Students also may need assistance using online texts and materials (Greer et al., 2014). And students whose medical conditions have limited their contact with peers may have had few opportunities to acquire effective interpersonal skills.
- *Consult and collaborate with specialists.* School districts usually employ a variety of specialists, including special educators, counselors, school psychologists, nurses, speech pathologists, and physical and occupational therapists. Some students leave the classroom for part of the day to work with these individuals. However, in today's inclusive schools, many special services are provided within a regular classroom context by teachers and specialists working in close collaboration.
- *Communicate regularly with parents.* In accordance with IDEA, parents are part of the multidisciplinary team that determines the most appropriate program for a student with special needs. Parents can often tell us what works and what doesn't, and they can alert us to certain conditions or events at home that may trigger problem behaviors in class. Furthermore, we can bring about desired behavioral changes more effectively if the same expectations for behavior exist both at school and at home.
- *Include students in planning and decision making.* Programs for most students with special needs—especially those with disabilities—are so highly structured that students have little say regarding what and how they learn. But increasingly, educators are recognizing the importance of letting *all* students make some choices about their academic goals and curriculum (Algozzine et al., 2001; Prout, 2009; Wehmeyer et al., 2007).

Such choice making can enhance both *self-regulation and autonomy*, discussed in Chapter 8 and Chapter 11, respectively.

- *Keep your eyes open for students who may qualify for special services.* The more we work with students in a particular age-group, the more we learn about their age-typical abilities and behaviors. Hence, we teachers are in an excellent position to identify children who, in one way or another, are *not* typical. Although specialists conduct the in-depth assessments necessary to identify particular special needs, the job of referring students for such assessments—and thereby gaining them access to the specialized services they may need—is ultimately up to teachers in general education classrooms.
- *Work with your other students toward acceptance and support of students with special needs.* As we've already noted, many students with disabilities have trouble being accepted by and developing friendships with peers in their classes (de Boer et al., 2013). Having a student with any type of exceptionality in our classroom is a wonderful opportunity for our other students. When a child or adolescent learns about various disabilities firsthand, and learns to respect and value these differences, such respect may last a lifetime. Moreover, reading stories in which a character has a disability, followed by discussion, can help students to learn about disabilities (Smith-D'Arezzo & Moore-Thomas, 2010).

Chapter 5 What Have You Learned?

Let's now review key points related to each of the chapter's learning outcomes.

5.1 Describe various perspectives on the nature of intelligence and identify several ways in which you can nurture intelligence in your own students. Intelligence involves the ability to apply prior knowledge and experiences flexibly to accomplish challenging tasks; it's apt to manifest itself differently in different cultures. Some researchers argue that intelligence is a single, biology-based entity that influences students' learning and performance across a wide variety of tasks and subject areas—a belief that's reflected in the use of IQ scores as general estimates of cognitive ability. Others disagree, proposing that intelligence consists of a number of somewhat independent abilities or, instead, that intelligent behavior varies considerably depending on a child's age and environmental support systems. As teachers, we must remember that human intelligence can and does change over time, especially with appropriate instruction and practice opportunities.

5.2 Explain how students' cognitive styles and dispositions might influence their classroom performance. *Cognitive styles* and *dispositions* are general inclinations to approach tasks in particular ways—for instance, to think analytically or holistically, or to approach new ideas in an open-minded or close-minded manner. We can encourage productive styles and dispositions through the messages we give about classroom subject matter (e.g., "Does the evidence support what scientists are saying about this topic?") and by modeling curiosity and enthusiasm for learning. Remember that there is virtually no evidence that designing instruction to match a student's preferred *learning style* will enhance their academic achievement.

5.3 Identify implications of the U.S. Individuals with Disabilities Education Act (IDEA) for your own work as a teacher. Students with special needs are those students who are different enough from their classmates that they require specially adapted instructional materials and practices to help them maximize their cognitive and social development. Increasingly, students with special needs are being educated in general education classrooms for part or all of the day; in the United States, such *inclusion* is in part the result of the Individuals with Disabilities Education Act (IDEA). Students with special needs are most likely to flourish in general education settings when classroom teachers collaborate with special educators, providing instruction and materials that are individualized to address any missing basic skills but also present challenges that spur developmental advancements.

5.4 Explain how you might adapt your instruction and classroom practices to the unique strengths and limitations of students with various disabilities. Students with specific cognitive or academic difficulties include those with learning disabilities, those with attention-deficit hyperactivity disorder (ADHD), and those with speech and communication disorders. Many instructional strategies must be tailored to students' specific difficulty areas, but some strategies are widely applicable; for instance, virtually all of these students benefit from early interventions, clear expectations for performance, and feedback that documents ongoing progress.

Students with social or behavioral problems include those with emotional and behavioral disorders (which might involve either externalizing or internalizing behaviors) and those with autism spectrum disorders. Many students with these disabilities benefit from training in interpersonal skills. They may also perform more successfully in a structured environment in which appropriate behaviors are clearly identified and consequences for desired and undesired behaviors are consistently administered.

Some students have general delays in cognitive and social functioning, and some of these students are formally diagnosed as having an intellectual disability. Effective instruction for these students usually involves a slow pace with considerable scaffolding and, eventually, explicit training in vocational and general life skills.

Students with physical and sensory challenges include those with physical and health impairments (conditions that result in reduced energy, alertness, or muscle control), visual impairments, or hearing loss. Although recommended instructional strategies vary considerably depending on students' specific disabilities, all of these students should have appropriate assistive technologies and access to the same educational resources and opportunities as their peers without disabilities.

5.5 **Explain how you might nurture the development of students who show exceptional gifts and talents.** Students identified as gifted benefit from instruction that challenges them to stretch their existing abilities in new directions. We must be open-minded about how we identify such students, as giftedness may take different forms in different cultural and ethnic groups. Strategies for promoting the achievement of gifted students include forming small study groups on specific topics, teaching complex cognitive skills within the context of various academic subject areas, and providing opportunities for independent study and service learning either within or outside of school walls.

Practice for Your Licensure Exam

Quiet Amy

As a veteran kindergarten teacher, Mr. Mahoney knows that many kindergartners initially have difficulty adjusting to the school environment, especially if they haven't previously attended day care or preschool. But Amy is giving him cause for concern. Amy never speaks, either to him or to the other children, even when she is directly spoken to. On the infrequent occasions when she wants to communicate, she does so primarily by looking and pointing at something or someone in the room. Amy also has trouble following simple directions, almost as if she hasn't heard what she's been asked to do. And she seems distracted during daily storybook readings and science lessons. The only activities that give her pleasure are arts and crafts. She may spend hours at a time working with construction paper, crayons, scissors, and glue, and her creations are often the most inventive and detailed in the class.

Mr. Mahoney suspects that Amy may have a disability that qualifies her for special services. To get permission for an in-depth evaluation of her abilities and needs, he and the school psychologist visit Amy's mother, a single woman raising five other children as well. "Amy doesn't talk at home either," the mother admits. "I work two jobs to make ends meet, and I haven't been able to spend as much time with her as I'd like. Her brothers and sisters take good care of her, though. They always seem to know what she wants, and they make sure she gets it."

1. **Multiple-choice question:**

   Mr. Mahoney suspects that Amy may qualify for special educational services. If she does, in which of the following categories of special needs is she *least* likely to fall?

   a. Hearing loss
   b. Autism spectrum disorders
   c. Speech and communication disorders
   d. Attention-deficit hyperactivity disorder

2. **Constructed-response question:**

   Amy's evaluation will undoubtedly take several weeks to complete. In the meantime, what strategies might Mr. Mahoney use to improve Amy's classroom behavior and performance? Describe at least three different things he might do. Be specific and concrete in your descriptions.

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 6

Behaviorist Views of Learning

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Learning Objectives

6.1 Describe basic assumptions of theories of learning and use these assumptions to help you better understand how people of all ages typically think and learn.

6.2 Describe five basic assumptions underlying behaviorist views of learning and apply these assumptions to classroom practices.

6.3 Explain how people can acquire involuntary responses through classical conditioning and how you might help students overcome classically conditioned emotional responses that interfere with their classroom performance.

6.4 Describe the effects that various kinds of consequences can have on behavior.

6.5 Apply behaviorist principles to encourage appropriate and productive behaviors throughout the school day.

6.6 Building on behaviorist ideas, describe four systematic approaches to addressing persistent behavior problems.

6.7 Accommodate students' personal and cultural backgrounds and special needs in your applications of behaviorist principles.

CASE STUDY

The Attention Getter

James is the sixth child in a family of nine children. He likes many things; for instance, he likes rock music, comic books, basketball, and strawberry ice cream. But more than anything else, James likes attention.

James is a skillful attention getter. He gets his teacher's attention by making outrageous remarks in class, throwing paper airplanes across the room, and refusing to turn in assignments. He gets his classmates' attention by teasing them, poking them, and writing obscenities on restroom walls. And by the middle of the school year, James antics are regularly earning him trips to the school office, where he gets the assistant principal's attention at least once a week.

- Why might James be choosing inappropriate behaviors, rather than more productive ones, in order to get attention? What general principle of learning might explain his behavior?

As you consider James's situation, think back to your own experiences as a student in elementary and secondary school. Which students received the most attention: those who behaved well or those who behaved poorly? Chances are, your teachers and classmates paid the most attention to *mis*behaving students (Landrum & Kauffman, 2006; Taylor & Romanczyk, 1994). James has undoubtedly learned that if he wants to be noticed—if he wants to stand out in a crowd—he must behave in ways that are hard to ignore. This is actually a type of learning: James has learned how to behave in class if he wants people to pay attention to him.

Basic Assumptions of Theories of Learning

Learning Objective 6.1 Describe basic assumptions of theories of learning and use these assumptions to help you better understand how people of all ages typically think and learn.

For our discussion in this book, we'll define **learning** as a long-term change in mental representations or associations as a result of experience. Let's divide this definition into its three parts. First, learning is a *long-term change,* in that it isn't just a brief, transitory use of information—for instance, remembering a phone number only long enough to make a phone call—but it doesn't necessarily last forever. Second, learning involves *mental representations or associations*; at its core, it's a phenomenon that takes place in the brain. Third, learning is a change *due to experience,* rather than the result of physiological maturation, fatigue, use of alcohol or drugs, or onset of mental illness.

Researchers have been studying the nature of learning for more than a century, and in the process they have taken a variety of theoretical perspectives. Table 6.1 summarizes four general perspectives, listed largely in the order in which they've gained influence in the field of psychology. We authors urge you *not* to think of these perspectives as being mutually exclusive. In fact, they tend to complement one another, and together they give us a richer picture of human learning—and also give us many more strategies for facilitating learning in instructional settings—than any single perspective could give us alone.

COMPARE/CONTRAST

Table 6.1 General Theoretical Approaches to the Study of Learning

Theoretical Perspective	General Description
Behaviorism	Behaviorists argue that the study of learning must focus on two things that researchers can objectively observe and measure: people's behaviors (*responses*) and the environmental events (*stimuli*) that immediately precede and follow those responses. Learning is viewed as a process of acquiring and modifying associations among stimuli and responses, largely through a learner's interactions with the environment. Behaviorism has been especially helpful in identifying effective strategies for encouraging productive classroom behaviors and discouraging inappropriate ones.
Social cognitive theory	Social cognitive theory focuses on the ways in which people learn *and think* based on their observations of other people. Often people learn through *modeling*—that is, they watch and imitate what other individuals do. Whether people learn and perform successfully is also a function of their *self-efficacy*, the extent to which they believe they can actually accomplish a particular task or achieve a particular goal. As social cognitive theory has evolved over time, it has increasingly incorporated the concept of *self-regulation*, in which people take charge of and direct their own actions. Social cognitive theory has had a significant impact on our understanding of human motivation as well as of human learning.
Cognitive psychology	Cognitive psychologists concern themselves primarily with what people think about as they learn from and respond to their environment. Many cognitive psychologists speculate about specific internal mechanisms that may underlie human cognition (e.g., *working memory* and *long-term memory*) and about mental processes that facilitate learning and memory; this approach is called **information-processing theory**. Other cognitive theorists (such as the developmental theorist Jean Piaget) focus on how individual learners create knowledge through their interactions with the environment; this approach is known as **individual constructivism**.
Contextual theories	Contextual theorists emphasize the ongoing and pervasive influences of learners' physical, social, and cultural environments on thinking and learning. Some contextual theorists (such as Vygotsky) suggest that young learners initially use sophisticated thinking strategies in social interactions and gradually *internalize* these strategies for their own, personal use; this approach is known as **sociocultural theory**. Other theorists focus on how two or more people can often gain more complete understandings by working together rather than alone; this approach is sometimes called **social constructivism**. Still other theorists propose that various ways of thinking are inextricably tied to particular physical or social circumstances; this approach goes by a variety of labels, including **situated learning** and distributed cognition.

The case of James demonstrates the application of behaviorism, which is the focus of this chapter. *Behaviorism* focuses on how people's local environments bring about changes in their behavior. We'll also use behaviorist ideas to understand how, as teachers, we can help students acquire behaviors that are more complex, productive, or prosocial than the ones they exhibit when they first enter our classrooms.

Basic Assumptions of Behaviorism

Learning Objective 6.2 Describe five basic assumptions underlying behaviorist views of learning and apply these assumptions to classroom practices.

Behaviorists focus on (1) the surrounding environment—that is, **stimuli** (plural of *stimulus*; sometimes abbreviated as **S**)—and (2) learners' behaviors, or **responses** (sometimes abbreviated as **R**). Accordingly, behaviorism is sometimes called *S–R psychology*.

Behaviorist concepts and principles can be quite useful in helping people of all ages acquire productive behaviors. Underlying the behaviorist perspective are several key assumptions.

- *People's behaviors are largely the result of their experiences with stimuli in their surrounding environments.* Many early behaviorists suggested that, with the exception of a few simple reflexes, a person is born as a "blank slate," with no inherited tendency to behave one way or another. Over the years the environment "writes" on this slate, slowly molding, or **conditioning**, the person into someone who has unique characteristics and behaviors.

  Across all of the theories of learning that we will explore, we'll see that our behaviors and achievements actually depend to some degree on genetically driven neurological changes as well as the culture(s) and societies in which we grow up. Yet specific past and present environments can have significant impacts as well. By making changes to our students' classroom environments, we can also change their behaviors for the better.

- *Learning involves a behavior change.* Whereas most people think of *learning* as a mental phenomenon, many behaviorists define it as a behavior change—in particular, learning is a *change in behavior as a result of experience.* Such a view of learning can often be useful in the classroom. Consider this scenario:

  > Your students look at you attentively as you explain a difficult concept. When you finish, you ask, "Any questions?" You look around the room and see that not a single hand is raised. "Good," you think, "everyone understands."

  But *do* your students understand? On the basis of what you've just observed, you really have no idea whether they do or don't. Only observable behavior changes—perhaps a greater frequency of independent reading, or a decline in off-task behaviors—can ultimately tell us that learning has occurred.

In contrast, the more cognitively oriented definition of learning that we'll explore in Chapter 7 (and that appears in the book's glossary) is this one: "a long-term change in mental representations or associations as a result of experience."

- *Learning involves forming associations among stimuli and responses.*

For example, the opening case study illustrates one key behaviorist principle: People are likely to learn and exhibit behaviors that bring about certain kinds of consequences. In particular, James has formed an association between his own disruptive behaviors (*responses*) and attention from other people (which is an environmental *stimulus* for James).

If we were to take a strict S–R perspective here, we wouldn't concern ourselves with what's going on inside James' head at all. Yet most contemporary behaviorists acknowledge that unobservable cognitive processes often underlie stimulus–response associations. As you read this chapter, you'll find that we authors occasionally allude to internal phenomena in our discussion of behaviorist principles.

- *Learning is most likely to take place when stimuli and responses occur close together in time*. When two events occur at more or less the same time—perhaps two stimuli are presented together, or perhaps a certain response is immediately followed by a certain stimulus—there is **contiguity** between them. The following examples illustrate contiguity:

  - One of your instructors (Professor X) scowls at you as she hands back an exam she has just corrected. You discover that you've gotten a D– on the exam, and your entire body tenses up. The next time Professor X scowls at you, that same body tension returns.
  - Another instructor (Professor Y) calls on you every time you raise your hand. Although you're fairly quiet in your other classes, you find yourself raising your hand and speaking up more frequently in this one.

  In the first situation, Professor X's scowl and the D– on your exam are presented more or less simultaneously. Here we see contiguity between two stimuli. In the second situation, your hand-raising response is followed immediately by Professor Y's request for your input. In this case, we see contiguity between a response and a subsequent stimulus (although calling on you is a response that Professor Y makes, it's a *stimulus* for *you*). In both situations a behavior has changed: You've begun to tighten your muscles every time one instructor scowls, and you've learned to raise your hand and speak up more often in another instructor's class.

- *Many species, including human beings, learn in similar ways.* Many behaviorist principles have been derived from research with nonhuman animals. For instance, as you'll see in a moment, our knowledge about classical conditioning first emerged from Ivan Pavlov's early work with dogs. And another well-known behaviorist, B. F. Skinner, worked almost exclusively with rats and pigeons. Students in our

PRINCIPLES/ASSUMPTIONS

Table 6.2 Basic Assumptions of Behaviorism and Their Educational Implications

Assumption	Educational Implication	Example
Influence of the environment	Create a classroom environment that encourages and supports desirable student behaviors.	When a student has a history of difficulty in working independently, quietly praise her every time she completes an assignment without having to be prompted.
Learning as a behavior change	Conclude that learning has occurred only when students exhibit a change in performance.	Regularly assess students' knowledge and skills in various content domains, and look for ongoing progress in what they know and can do.
Focus on observable events (stimuli and responses)	Identify specific stimuli—including your own actions as a teacher—that may be influencing students' behaviors either for better or for worse.	If a student frequently engages in disruptive classroom behavior, consider whether you might be encouraging such behavior by giving them attention every time they misbehave.
Contiguity of events	If you want students to associate two events (stimuli, responses, or stimulus and response), make sure those events occur close together in time.	Include enjoyable yet educational activities in each day's schedule as a way of helping students associate school subject matter with pleasurable feelings.
Similarity of learning principles across species	Remember that research with nonhuman species often has relevance for classroom practice.	Reinforce a hyperactive student for sitting quietly for successively longer time periods—a *shaping* process based on early research studies with rats and pigeons.

own educational psychology classes sometimes resent having human learning compared to that of laboratory rats. But, in fact, behaviorist principles developed from the study of nonhuman animals are often quite helpful in explaining human behavior.

Table 6.2 summarizes the five assumptions just described and draws general implications for classroom practice.

Building on Existing Stimulus–Response Associations: Classical Conditioning

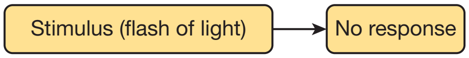
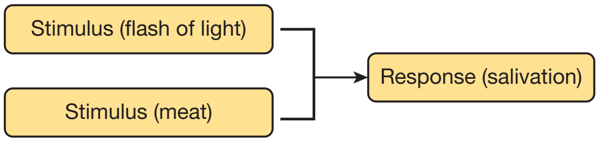
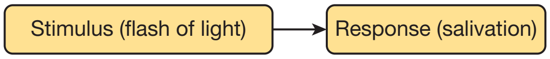
Learning Objective 6.3 **Explain how people can acquire involuntary responses through classical conditioning and how you might help students overcome classically conditioned emotional responses that interfere with their classroom performance**

Consider this situation:

> Alan has always loved baseball. But while he was up at bat in a game last year, he was badly hurt by a wild pitch. Now, although he still plays baseball, he gets anxious whenever it's his turn at bat, to the point that his heart rate increases, and he often backs away from the ball instead of swinging at it.

One possible explanation of Alan's behavior is **classical conditioning**, a theory that explains how we sometimes learn new responses as a result of two stimuli being presented at approximately the same time. Alan experienced two stimuli—an oncoming baseball and its painful impact—almost simultaneously. The ways in which Alan now responds to a pitched ball—his physiological reaction and withdrawal behavior—are ones he didn't exhibit before his painful experience with the baseball. Thus, *learning* has occurred.

Classical conditioning was first described by Ivan Pavlov (e.g., 1927), a Russian physiologist who was conducting research about salivation. Pavlov often used dogs in his research and presented meat to get them to salivate. He noticed that the dogs frequently began to salivate as soon as they heard a lab assistant coming down the hall, even though they couldn't yet smell the meat that the assistant was bringing. Curious about this phenomenon, Pavlov conducted an experiment to examine more systematically how a dog might learn to salivate in response to a new stimulus. His experiment went something like this:

> Pavlov first flashes a light and sees that the dog doesn't salivate, as depicted in the following diagram:
>
> 
>
>
> Pavlov flashes the light a second time and presents meat immediately afterward. He repeats this procedure several more times, and the dog always salivates. The dog is demonstrating something it already knows how to do—salivate to meat—and hasn't yet learned anything new. We can symbolize Pavlov's second observation like so:
>
> 
>
>
> After a sequence of such light-and-meat pairings, Pavlov flashes only the light, with no meat within range of sight or smell. The dog salivates once again—in other words, it has *learned* a new response to the light stimulus. We can symbolize Pavlov's third observation this way:
>
> 
>

In general terms, classical conditioning is a three-step process, as shown in Figure 6.1:

1. It begins with a stimulus–response association that already exists—in other words, an *unconditioned* S–R association. Pavlov's dog salivates automatically whenever it smells meat, and Alan becomes upset and backs away whenever he encounters an object that causes him pain. When a stimulus already leads to a particular response in the situation at hand, we say that an **unconditioned stimulus (UCS)** elicits an **unconditioned response (UCR)**.[1] The unconditioned response is typically an automatic, involuntary one over which the learner has little or no control.
2. Conditioning occurs when a *neutral stimulus*—one that doesn't elicit any noteworthy response—is presented immediately before the unconditioned stimulus. In the case of Pavlov's dog, a light is presented immediately before the meat. In the case of Alan, a baseball is pitched immediately before the painful impact. Conditioning is especially likely to occur when both stimuli are presented together on several occasions and when the **neutral stimulus** occurs *only* when the unconditioned stimulus is about to follow (Miller & Barnet, 1993; Rachlin, 1991). Sometimes one pairing is enough, especially if the unconditioned stimulus is a very painful or frightening one.
3. Before long, the new stimulus also elicits a response—usually one that's very similar to the unconditioned response. At this point, the neutral stimulus has become a **conditioned stimulus (CS)**, and the response to it has become a **conditioned response (CR)**. For example, Pavlov's dog acquires a conditioned response of salivation to a new, conditioned stimulus—the light. Likewise, Alan acquires conditioned responses of increased heart rate and withdrawal—both of which reflect *anxiety*—to a rapidly approaching baseball. Like the unconditioned response, the conditioned response is an involuntary one: It occurs automatically every time the conditioned stimulus is presented.

---

[1] In discussions of classical conditioning, behaviorists often use the word *elicit* (meaning "draw forth or bring out"), as we do here. The word conveys the idea that learners have little or no control over their classically conditioned responses. Also, you should note that the UCS–UCR association as described here could involve either a biologically built-in reflex or an association that has been acquired earlier in the learner's life.

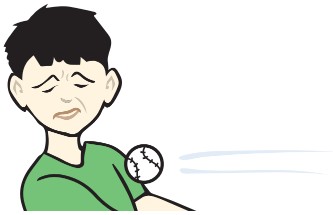
Figure 6.1 Thinking of classical conditioning as a three-step process.

STEP 1

Unconditioned stimulus (UCS)
- e.g., meat
- e.g., object causing pain

→

Unconditioned response (UCR)
- e.g., salivation
- e.g., psychological reaction, behavioral withdrawal



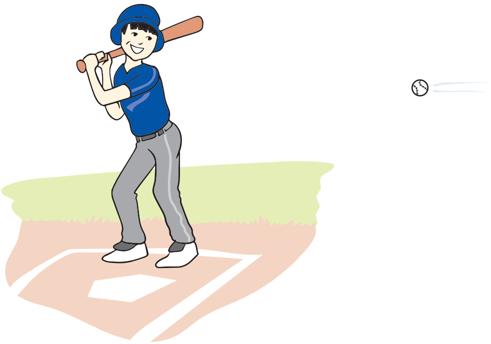
STEP 2

Neutral stimulus (NS)
- e.g., flash of light
- e.g., pitched baseball

Unconditioned stimulus (UCS)
- e.g., meat
- e.g., object causing pain

→

Unconditioned response (UCR)
- e.g., salivation
- e.g., psychological reaction, behavioral withdrawal

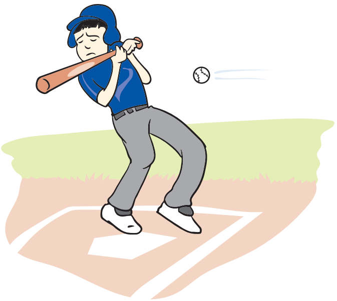


STEP 3

Conditioned stimulus (CS)
- e.g., flash of light
- e.g., pitched baseball

→

Conditioned response (CR)
- e.g., salivation
- e.g., psychological reaction, escape



Classical Conditioning of Involuntary Emotional Responses

Classical conditioning can help us understand how people learn a variety of involuntary responses, especially responses associated with physiological processes, emotions, and other relatively "thoughtless" aspects of human functioning (e.g., Mineka & Zinbarg, 2006; Watson & Rayner, 1920). This is a very important point: Classical conditioning can help us understand how students might develop fears or anxiety that manifest only in certain places (e.g., the cafeteria) or during certain instructional activities (e.g., when asked to read out loud). Following are two examples of how unpleasant emotional responses might be learned through classical conditioning. Notice that in each case, two stimuli are presented together: One stimulus already elicits a response, and the second stimulus begins to elicit a similar response as a result of the pairing.

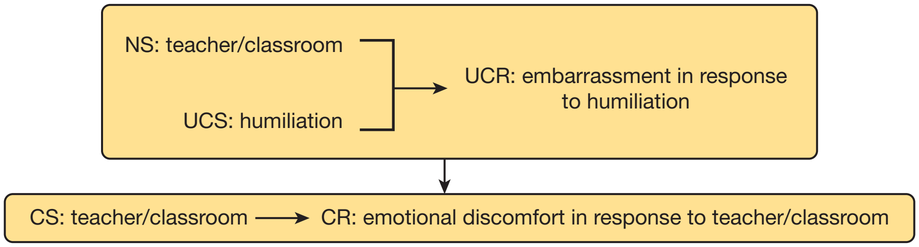
- Bobby misses a month of school because of illness. When he returns to school, he doesn't know how to do the long division problems his teacher is now assigning. After a number of frustrating experiences with the assignments, he begins to feel anxious whenever he encounters a division task.

NS: long division problem
UCS: failure/frustration
→ UCR: anxiety in response to failure

↓

CS: long division problem → CR: anxiety in response to long division problem

- Beth's teacher catches her writing a note to a friend during class. The teacher reads the note to the entire class, revealing some very personal information that embarrasses her. Beth now feels extremely uncomfortable whenever she goes into that teacher's classroom.


NS: teacher/classroom
UCS: humiliation
UCR: embarrassment in response to humiliation
CS: teacher/classroom
CR: emotional discomfort in response to teacher/classroom

As teachers, we should create a classroom environment in which stimuli—including our own behaviors—are likely to elicit pleasant responses such as enjoyment or excitement, *not* fear or anxiety. When students associate school with pleasurable circumstances, they soon learn that school is a place they want to be. But when they encounter unpleasant stimuli in school—perhaps public humiliation or constant frustration and failure—they may eventually learn to fear or dislike a particular activity, subject area, teacher, or school in general.

Create a classroom atmosphere in which students feel physically and psychologically safe and secure.

Common Phenomena in Classical Conditioning

Two common phenomena in classical conditioning are generalization and extinction. As you'll discover later in the chapter, variations of these phenomena occur in instrumental conditioning as well.

Generalization When people acquire a conditioned response to a new stimulus, they may respond in the same way to similar stimuli—a phenomenon that behaviorists call **generalization**. For example, a boy who learns to feel anxious about long division problems may generalize the anxiety response to other kinds of math problems. And a girl who experiences humiliation in one classroom may generalize her feelings of embarrassment to other classrooms as well. Thus, we see a second reason that students should associate pleasant feelings with school subject matter: Students' reactions to a particular topic, activity, or context may generalize—that is, they may *transfer*—to other topics, activities, or contexts.

Extinction Pavlov discovered that conditioned responses don't necessarily last forever. By pairing a light with meat, he conditioned a dog to salivate to the light alone. But later, when he repeatedly flashed the light without following it with meat, the dog salivated less and less. Eventually, the dog no longer salivated to the light flash. When a conditioned stimulus occurs repeatedly *in the absence of* the unconditioned stimulus—for example, when math is never again associated with failure or when a teacher is never again associated with humiliation—the conditioned response may decrease and eventually disappear. In other words, **extinction** can occur.

Spontaneous Recovery Extinction isn't necessarily permanent. Sometimes if a learner is once again presented with a conditioned stimulus, the conditioned response may reemerge. For example, Jackie, a student in the third grade, is repeatedly bullied by a group of peers on the school playground. Jackie experiences fear and stress whenever she returns to the playground that year. However, the bullying did not occur again when Jackie was in the fourth grade, and the feelings of fear and stress went away (i.e., extinction occurred). During the fifth grade, one day when Jackie's class is at recess at the playground, Jackie sees the group of children who used to bully her approaching; the feelings of fear and stress come rushing back (i.e., spontaneous recovery occurred).

Many conditioned responses do fade over time. Unfortunately, many others do not. For instance, children's classically conditioned fear of dogs or deep water—perhaps the result of a painful dog bite or near-drowning experience—can persist for years. One reason that fears and anxieties persist is that learners tend to avoid situations that elicit negative emotional reactions. But if they stay away from a stimulus that makes them fearful, they never have a chance to experience the stimulus in the absence of the unconditioned stimulus with which it was originally paired. As a result, they have no opportunity to learn to be *un*afraid—no opportunity for the response to undergo extinction.

Addressing Counterproductive Emotional Responses

As teachers, how can we weaken conditioned responses that interfere with students' learning and performance? One effective way to extinguish a negative emotional reaction to a particular conditioned stimulus is to introduce the stimulus *slowly and gradually* while a student is happy, relaxed, or in some other way feeling good (Jones, 1924; Ricciardi et al., 2006). For example, if Becca is afraid of deep water because of a near-drowning incident at some point in her past, we might begin swimming lessons someplace where she feels at ease—perhaps on dry land or in a wading pool—and move to a deeper pool only as she begins to feel more comfortable. And if Bobby gets overly anxious every time he encounters a math problem, we might revert to very easy problems—those he can readily solve—and gradually increase the difficulty of his assignments only as he demonstrates greater competence and self-confidence.

When a particular topic or task arouses anxiety, present it slowly and gradually while the learner is happy and relaxed.

There's nothing like success to help students feel good about being at school. One way to promote student success is to structure the classroom environment so that appropriate behaviors lead to desirable consequences and inappropriate behaviors do not, as we'll see in the next section.

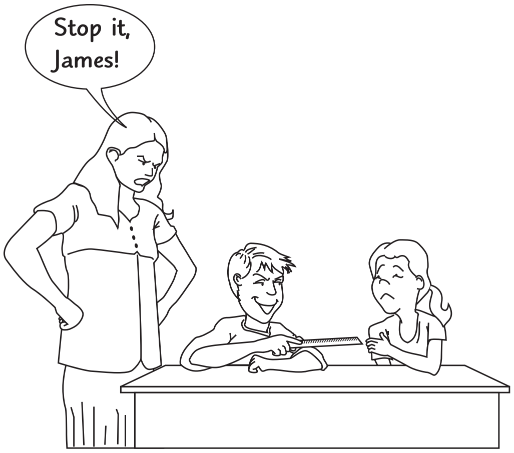
Learning from Consequences: Instrumental Conditioning

Learning Objective 6.4 Describe the effects that various kinds of consequences can have on behavior.

Mark is a student in Ms. Ferguson's geography class. Let's look at what happens to him during the first week in October:

- *Monday:* Ms. Ferguson asks students where Colombia is. Mark knows that Colombia is at the northern tip of South America. He sits smiling, with his hands in his lap, hoping to be called on. Instead, Ms. Ferguson calls on another student.
- *Tuesday:* Ms. Ferguson asks the class where Colombia got its name. Mark reasonably guesses that it was named after Christopher Columbus, so he raises his hand a few inches. Ms. Ferguson calls on another student.
- *Wednesday:* Ms. Ferguson asks the class why Colombia's official language is Spanish rather than, say, English or French. Mark knows that Colombians speak Spanish because many of the country's early European settlers came from Spain. He raises his hand high in the air. Ms. Ferguson calls on another student.
- *Thursday:* Ms. Ferguson asks the class why Colombia grows coffee, but Canada doesn't. Mark knows that coffee can grow only in certain climates. He raises his hand high and waves it wildly back and forth. Ms. Ferguson calls on him.
- *Friday:* Whenever Ms. Ferguson asks a question Mark can answer, he raises his hand high and waves it wildly about.

Several of Mark's behaviors bring no results. But waving his hand wildly brings Mark the outcome he wants—a chance to speak in class—and so it increases in frequency.


Stop it, James!

Teachers' and peers' attention is often a *reinforcer*—that is, it *increases* the behavior it follows—even if the messages being communicated are intended to discourage the behavior.

When learners' behaviors either increase or decrease as a result of the consequences those behaviors bring about, **instrumental conditioning** is at work. Consequences that *increase* the behaviors they follow are **reinforcers**, and the act of following a particular response with a reinforcer is known as **reinforcement**. Conversely, consequences that *decrease* the behaviors they follow constitute **punishment**. Both reinforcers and punishments are environmental *stimuli* that influence behavior.

In his research with animals, B. F. Skinner was a very influential early behaviorist. Skinner found that reinforcers increased the behaviors they followed (e.g., Skinner, 1938, 1953, 1954). Skinner used the term **operant conditioning** to refer to reinforcement-based learning. We'll use the more inclusive term *instrumental conditioning* in the rest of the chapter, since it acknowledges that under certain conditions, punishment can be used to reduce inappropriate behaviors.

Notice that we've defined both *reinforcer* and *punishment* in terms of their effects on behavior, rather than in terms of their relative pleasantness and desirability. Sometimes people engage in certain behaviors in order to get consequences that most of us would think of as unpleasant—consequences that we certainly wouldn't think of as "rewards." As an example, let's return to the opening case study. When James throws objects, makes outrageous comments, and pokes classmates, we can assume that his teacher is probably frowning at or scolding him, which we don't usually think of as desirable outcomes. Yet those consequences are leading to an increase in James's misbehaviors; thus, they're apparently reinforcing for him. Other people's attention, regardless of the form it might take, can be highly reinforcing for some students and often serves to maintain counterproductive classroom behaviors (Mueller et al., 2011; Rodriguez et al., 2010).

Punishment, too, seems to be in the eye of the beholder. For example, some seemingly very desirable forms of attention, such as teacher praise, can be a must-to-avoid—and hence are actually punishment—for adolescents who don't want their peers to think of them as a "goodie-two-shoes" or teacher's pet (Burnett, 2001).

Contrasting Classical Conditioning and Instrumental Conditioning

Classical conditioning and instrumental conditioning both involve stimuli and responses. But instrumental conditioning is different from classical conditioning in two important ways:

- *The response is voluntary rather than involuntary.* In classical conditioning, the learned response is typically out of the learner's control: It's an automatic, involuntary reaction to a conditioned stimulus. In instrumental conditioning, however, the learner has considerable decision-making power regarding the response. For example, in the opening case study, James can choose whether to make inappropriate comments, toss paper airplanes, or tease classmates; nothing in his environment is forcing him to do these things.

  The voluntary nature of responses in instrumental conditioning is an important one for teachers to keep in mind. In order for such conditioning to occur, *learners must first make a response.* Many educational applications of behaviorist principles, then, involve getting students physically and actively engaged in working with academic subject matter.

Get students physically and actively engaged in working with classroom topics.

- *Learning occurs as a result of a stimulus that comes after—rather than before—the response.* Classical conditioning results from the pairing of two stimuli, one (the UCS) that initially elicits a response and another (the CS) that begins to elicit the same or a similar response. Thus, these two stimuli automatically *evoke* certain responses. In instrumental conditioning, however, the learner makes the first move, and an environmental stimulus (either a reinforcer or punishment) follows. Typically, there's a **contingency** between the response and the consequence: The consequence almost always follows the response and seldom occurs when the response hasn't been made. For example, a teacher who praises students only when they behave appropriately is making reinforcement contingent on desired behavior. In contrast, a teacher who laughs at the antics of a chronically misbehaving student is providing reinforcement even when an acceptable response hasn't occurred; as a result, the student's behavior is unlikely to improve.

Don't confuse *contingency* with the term *contiguity*, introduced near the beginning of the chapter. Contingency involves an if-this-happens-then-that-happens relationship. In contrast, contiguity simply involves two things happening at about the same time. Effective instrumental conditioning usually involves contiguity as well as contingency; that is, the consequence occurs almost immediately after the response (Kulik & Kulik, 1988; Rachlin, 1991). The immediacy of reinforcement or punishment after a response is especially important when working with young children. It's less critical for older children and adolescents, who are better able to make a mental connection between what they do *now* with what happens to them *later* (more on this point shortly).

The Various Forms that Reinforcement Can Take

Reinforcers come in all shapes and sizes, and different ones are effective for different individuals. We explore a few possibilities in the following exercise.

Experiencing Firsthand

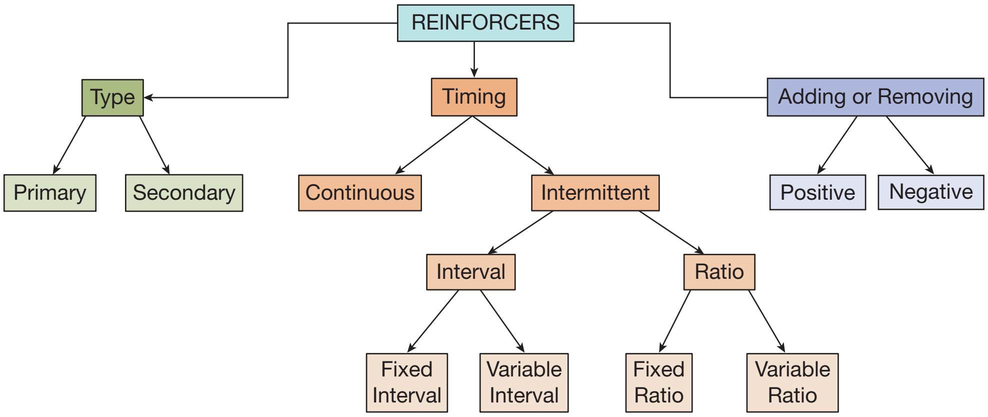
What Would It Take?

1. Imagine that one of your instructors asks you if you'd be willing to spend an hour after class tutoring two classmates who are having trouble with the course material. You have no other commitments for that hour, but you'd really like to spend the time at a nearby coffee shop where several friends are having lunch. What would it take for you to spend the hour tutoring your classmates instead of joining your friends? Would you do it to gain your instructor's approval? How about if your instructor gave you $5? Would you do it simply because it made you feel good to be helping someone else? Write down a consequence—perhaps one of the consequences just listed or perhaps a different one altogether—that would persuade you to help your classmates instead of meeting your friends.
2. A few weeks later, your instructor asks you to spend the weekend (eight hours a day on both Saturday and Sunday) tutoring the same two struggling classmates. What would it take this time to convince you to do the job? Would the instructor's approval do the trick? Five dollars? Five *thousand* dollars? Or would your internal sense of satisfaction be enough? Once again, write down what it would take for you to agree to help your classmates.

There are no right or wrong answers to the preceding exercise; different people would agree to tutor classmates for different reasons. But you were probably able to identify at least one consequence in each situation that would entice you to give up your free time to help others.

Reinforcers are often over-used. *If a student is already engaging in a desired behavior, there usually is no reason to use a reinforcer*. When we do decide to use reinforcers with the goal of increasing the occurrence of a particular behavior, there are several types of reinforcers available. As a teacher, there are several different aspects of reinforcement that you should consider. These are summarized in Figure 6.2.

Figure 6.2 Different types of reinforcers



Type of Reinforcer: Primary versus Secondary Some reinforcers are **primary reinforcers**, because they address a basic, built-in biological or psychological need. Food, water, sources of warmth, and oxygen are all primary reinforcers. To some extent, physical affection and cuddling address built-in needs as well, and for an adolescent addicted to an illegal substance, the next "fix" is a primary reinforcer (Harlow & Zimmerman, 1959; Lejuez et al., 1998; Vollmer & Hackenberg, 2001).

Other reinforcers, known as **secondary reinforcers**, don't satisfy any physiological or other "prewired" need; instead, learners *come to* appreciate them. Praise, money, good grades, and trophies are examples. Such stimuli may become reinforcing over time through their association with other stimuli that already have a reinforcing effect. For example, if praise is occasionally associated with a special candy treat from mom, and if money often comes with a hug from dad, the praise and money eventually become reinforcing in and of themselves. In this way, seemingly unpleasant stimuli can become reinforcers. For instance, if James regularly associates a teacher's scolding with something he wants—more attention—then a scolding may indeed become a reinforcer in its own right.

Keep in mind that not all students have learned to appreciate such secondary reinforcers as praise and good grades.

Secondary reinforcers are far more common in classrooms than are primary reinforcers. In fact, making primary reinforcers (e.g., lunch, restroom breaks) contingent on certain levels of performance is generally *not* good teaching practice. When we use secondary reinforcers, however, we must remember that they're *learned* reinforcers, and not everyone will appreciate them. Although most students respond positively to such consequences as praise and good grades, a few students may not.

Timing of Reinforcers The fourth-grade teachers at Broadmoor Elementary School have been trying to get their students to spend more time reading. The teachers have been encouraging their students to read whatever they want after they have completed other assignments and have free time on their hands. Mrs. Byrnes decides to give her students a piece of candy every time they choose to read during their free time; in contrast, Mr. Robinson decides to give his students a piece of candy as a reward for choosing to read, but he only does this once in a while. Do you think that Mrs. Byrnes' or Mr. Robinson's approaches will lead to different results?

There are several different ways to think about the timing with which reinforcers are used. By giving her students some candy every time they decide to read, Mrs. Byrnes is providing **continuous reinforcement**. In contrast, Mr. Robinson is using **intermittent reinforcement**, since he only gives out candy every now and then. But then another question arises: If intermittent reinforcement is used, how often should the reinforcer be provided?

Intermittent reinforcements can be provided after a certain amount of time has passed, or after a certain number of appropriate behaviors have occurred. An **interval**

schedule of reinforcement is used when the reinforcement is provided if the student engages in the desired behavior after a certain period of time has passed (e.g., students are given 15 minutes of extra recess every Friday if they behaved well in class during the week). In contrast, a **ratio schedule of reinforcement** is used when reinforcement is provided after a certain number of desired behaviors have occurred (e.g., a student gets candy for every five long-division problems they solve correctly).

With interval schedules, reinforcers can be given consistently after a certain amount of time has passed (e.g., after two days have passed), or in a less predictive manner (e.g., sometimes the student can be reinforced after one day, sometimes after two days, and sometimes after three days). And with ratio schedules, reinforcers can be given after a specific number of desired behaviors have occurred (e.g., after every three occurrences), or less predictably (e.g., sometimes the reinforcer is given after the behavior has occurred once, sometimes after three occurrences, and sometimes after eight occurrences).

> As an example, let's consider Molly and Maria, two students who rarely participate in class discussions. Their teacher, Mr. Oliver, decides to reinforce the girls for raising their hands. Each time Molly raises her hand, Mr. Oliver calls on her and praises her response. But when Maria raises her hand, Mr. Oliver isn't always looking in her direction; hence he calls on her on some occasions but not others. Molly is getting continuous reinforcement and Maria is getting intermittent reinforcement. Other things being equal, Molly's hand raising should increase more rapidly than Maria's.
>
> Now let's move ahead a few weeks. Thanks to Mr. Oliver's attentiveness to Molly and Maria, both girls are now regularly volunteering in class. Consequently, Mr. Oliver turns his attention to other quiet students and no longer reinforces Molly and Maria when they raise their hands. As you might expect, the girls begin to participate less often; in other words, we see signs of extinction. But which girl's class participation will extinguish more quickly?
>
> If you predicted that Molly's volunteering will decrease more rapidly than Maria's, you're right. Responses that have previously been continuously reinforced tend to extinguish quickly once reinforcement stops. But if reinforcement has not been received continuously, the behavior will endure. Behaviors that have been reinforced only intermittently decrease slowly, if at all, after reinforcement ceases. In other words, these behaviors can be more *resistant to extinction* (e.g., Freeland & Noell, 1999; Pipkin & Vollmer, 2009).

For the most part, intermittent reinforcement is more effective than continuous reinforcement. When students are rewarded every time that they engage in a desired behavior, they may feel like they only should engage in that behavior (e.g., reading during free time) if they'll get a reward. When reinforcements are given sporadically and unpredictably, students are more likely to continue to engage in the desired behavior. Fixed reinforcement schedules are often less effective than variable schedules, because the predictability of when a reinforcement will be given can lead students to only engage in the behavior when a reinforcement is expected (Schunk, 2016; Skinner, 1938, 1953).

We'll discuss the impacts of reinforcers on students' motivation in Chapter 10.

Adding or Removing Reinforcers: Positive versus Negative Reinforcement All reinforcements increase the occurrence of behaviors. But reinforcers can be either presented or removed after a behavior has occurred. **Positive reinforcement** occurs when a reinforcer is introduced or presented after the behavior occurs; in contrast, **negative reinforcement** occurs when a reinforcer is removed after the behavior has occurred.

Positive reinforcement. Whenever a particular stimulus is *presented* after a behavior and the behavior increases as a result, *positive reinforcement* has occurred. Don't be misled by the word *positive*, which in this case has nothing to do with the pleasantness or general desirability of the stimulus being presented. Positive reinforcement can occur even when the presented stimulus is one that others might think is *un*pleasant or

Be aware that certain consequences that seem "negative" (e.g., scoldings, bad grades) may nevertheless be *positively* reinforcing for some students.

*un*desirable. The word *positive* here simply means *adding* something to the situation. For example, some students may make a response to get a teacher's praise, but others (like James in the opening case study) may behave in a way that gets them a scolding. Most students will work for As, but a few may actually prefer Cs or even Fs. (As a school psychologist, one of us authors once worked with a high school student who used Fs as a way to get revenge on his overly controlling parents.) Depending on the individual, any one of these stimuli—praise, a scolding, an A, or an F—can be a positive reinforcer. Following are examples of the forms that positive reinforcement can take:

- A *concrete reinforcer* is an actual object—something that can be touched (e.g., a snack, a sticker, a toy).
- A *social reinforcer* is a gesture or sign (e.g., a smile, attention, or "thank you") that one person gives another, usually to communicate positive regard.
- An *activity reinforcer* is an opportunity to engage in a favorite pastime. Learners will often do one thing—even something they don't like to do—if it enables them to do something they enjoy. For example, children with attention-deficit hyperactivity disorder (ADHD) are more likely to sit quietly during a lesson if they know that doing so will enable them to engage in a more physically lively activity afterward (Azrin et al., 2007).
- A *token reinforcer* is a small, insignificant item (e.g., poker chip, specially marked piece of colored paper) that a learner can later use to "purchase" a desired object or privilege. It's often used in a *token economy,* a strategy to be described a bit later.
- Sometimes the simple message that an answer is correct or that a task has been done well—*positive feedback*—is reinforcement enough. In fact, sometimes even *negative* feedback can be reinforcing if the overall message is a positive one. The Creating a Productive Classroom Environment feature "Using Feedback to Improve Learning and Behavior" offers suggestions based on research by behaviorists, cognitive psychologists, and motivation theorists.

The reinforcers just listed are **extrinsic reinforcers**—those provided by the external environment (often by other people). Yet some positive reinforcers are **intrinsic reinforcers**—those that come from learners themselves or are inherent in tasks being performed. When students engage in certain activities in the absence of any observable reinforcers—when they read an entire book without putting it down, do extra classwork without being asked, or practice with a neighborhood rock group into the wee hours of the morning—they're probably working for the intrinsic reinforcement that such activities yield. Intrinsic reinforcers are *not* observable events and thus don't fit comfortably within traditional behaviorist theory. Yet students clearly do engage in some behaviors solely for the intrinsic satisfaction their behaviors bring. For instance, in the earlier "What Would It Take?" exercise, if you agreed to help your classmates simply because doing so would make you feel good, you would be working for an intrinsic reinforcer. If a student is intrinsically reinforced for engaging in an activity (e.g., silent reading), there is no reason to introduce extrinsic reinforcers.

In classroom settings, positive feedback (an extrinsic reinforcer) and the feelings of pleasure and satisfaction that such feedback can bring (intrinsic reinforcers) are probably the most desirable forms of reinforcement. But we must remember that the classroom successes that yield such forms of reinforcement can occur only when instruction has been carefully tailored to individual skill levels and abilities and only when students have learned to value academic achievement. If students aren't motivated to achieve academic success for whatever reason, then social reinforcers, activity reinforcers, and occasionally even concrete reinforcers can be used to increase desired behaviors.

Negative reinforcement. Whereas positive reinforcement involves the presentation of a stimulus, *negative reinforcement* brings about the increase of a behavior through the *removal* of a stimulus—typically an unpleasant one, at least from the learner's

Creating a Productive Classroom Environment

Using Feedback to Improve Learning and Behavior

- **Be explicit about what students are doing well—ideally, at the time they are doing it.**

  When praising her students for appropriate behavior, a second-grade teacher is quite specific about the actions for which she's commending them. For example, she says, "I like the way you're working quietly," and "You should see Ricky being so polite. Thank you, Ricky, for not disturbing the rest of the class."

- **Use a clicker or similar device to provide immediate auditory reinforcement for desired behaviors that occur within the performance of a lengthy, complex motor skill.**

  As she teaches three 9-year-olds several complex dance moves, a dance instructor uses a hand-held clicker to let the students know when they've executed particular parts of a move especially well.

- **Give concrete, individualized guidance about how students can improve their performance.**

  A high school physical education teacher tells a student, "Your time in the 100-meter dash wasn't as fast as it could have been. It's early in the season, though, and if you work on your endurance, I know you'll improve. Also, I think you might get a faster start if you stay low when you first come out of the starting blocks."

- **Communicate optimism that students can improve.**

  When a student in a middle school geography class gives her oral report on Cambodia, she goes on at length about her family's recent trip to Siem Reap, showing many photos, postcards, and souvenirs to illustrate her remarks. The other students soon become bored and communicate their displeasure through body language and occasional whispers. At the end of class, the student is devastated that her report has been so poorly received. Her teacher takes her aside and gently says, "You included many interesting facts in your report, Julie, and all your pictures and artifacts really helped us understand Cambodian culture. But you know how young teenagers are—they can have a pretty short attention span at times. I'll be assigning oral reports again next semester. Before you give yours, let's sit down and plan it so that your classmates will think, 'Wow, this is really interesting!'"

- **Don't overwhelm students with too much feedback; tell them only what they can reasonably attend to and remember at the time.**

  As a kindergarten teacher watches one of his students practice writing alphabet letters, he helps the student hold her pencil in a way that gives her better control. He doesn't mention that she's writing her *B*s and *D*s backward; he'll save this information for later, after she has mastered her pencil grip.

- **Minimize feedback when students already know exactly what they've done well or poorly.**

  A high school math teacher has a student who has been getting poor grades in large part because of insufficient effort. When the student begins to do his homework regularly, his quiz scores improve. As his teacher hands back his first quiz after his newfound diligence—a quiz on which he's earned a score of 96%—she says nothing but smiles and gives him a private thumbs-up.

- **Teach students strategies for asking for teacher feedback appropriately.**

  A fourth-grade teacher has two students with intellectual disabilities in her class. She knows that these students may need more frequent feedback than their classmates. She teaches them three steps to take when they need her assistance: (1) They should raise their hands or walk quietly to her desk; (2) they should wait patiently until she has time to speak with them; and (3) they should make their needs known (e.g., "How am I doing?" "What do I do next?").

SOURCES: Bangert-Drowns et al., 1991; Boyanton, 2010; Butler & Winne, 1995; Craft et al., 1998, p. 402 (students-with-disabilities example); Feltz et al., 1999; Hattie & Gan, 2011; Hattie & Timperley, 2007; Koenka & Anderman, 2019; Narciss, 2008; Quinn et al., 2015 (clicker example); Schunk & Pajares, 2005; Shute, 2008; Stokes et al., 2010a.

perspective. Negative reinforcement is often confused with punishment. Keep in mind that whether positive or negative reinforcement is being used, the goal is to increase the occurrence of a behavior. The word *negative* here isn't a value judgment. It simply refers to the act of *taking away,* rather than adding, a stimulus.[2] When people make a response in order to get rid of something and the frequency of the response increases as a result, they're being negatively reinforced.

Imagine, for example, that you have a difficult assignment you must complete for one of your classes. Because you don't like the assignment hanging over your head, you finish it and give it to your instructor well before its due date. After you turn it in, you feel much better: You've gotten rid of that annoying *worry* feeling. If you find yourself completing future assignments early as well, then you've been negatively reinforced for your complete-something-before-due-date behavior.

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[2] You might draw an analogy between positive versus negative reinforcement and positive versus negative numbers. Positive numbers and positive reinforcement both add something to a situation. Negative numbers and negative reinforcement both subtract something from a situation.

We can see another possible example of negative reinforcement in the opening case study. When James misbehaves, his teacher sometimes sends him to the assistant principal's office. By doing so, the teacher may be negatively reinforcing his troublesome behavior. In particular, James *gets out of class*, thereby removing a stimulus—some aspect of the classroom environment—that may be aversive for him. (If James likes spending time with the assistant principal, he's receiving positive reinforcement as well.) Whereas some students misbehave in class primarily to get attention (a positive reinforcer), others may misbehave to escape something they don't want to do, such as a difficult assignment, and their escape behavior is negatively reinforced (Metsäpelto et al., 2015; Mueller et al., 2011; Payne & Dozier, 2013). Students may learn other escape behaviors as well, as one student with a learning disability revealed:

> When it comes time for reading I do everything under the sun I can to get out of it because it's my worst nightmare to read. I'll say I have to go to the bathroom or that I'm sick and I have to go to the nurse right now. My teacher doesn't know that I'll be walking around campus. She thinks I am going to the bathroom or whatever my lame excuse is. All I really want to do is get out of having to read. (Zambo & Brem, 2004, p. 5)

When students consistently behave in ways that enable them to avoid or escape certain activities, identify and address possible reasons that students find the activities aversive.

As teachers, we should use negative reinforcement rarely, if at all. Ideally, we want to create a classroom environment in which there are few stimuli that students want to escape. Nevertheless, we should recognize that negative reinforcement *does* have an effect on behavior. Some students may finish an assignment more to get it out of the way than for any intrinsic satisfaction the assignment brings. Others may engage in a variety of responses—perhaps misbehaving or identifying imaginary reasons for leaving the classroom—as a way of avoiding the assignment altogether. When certain responses enable students to eliminate or escape unpleasant stimuli, those responses will increase in frequency.

Looking at Reinforcement from a Developmental Perspective Children's preferences for various kinds of reinforcers tend to change with age. For example, concrete reinforcers (e.g., stickers depicting popular cartoon characters, small trinkets) can be effective with young children, but teenagers are more likely to appreciate opportunities to interact with friends. Table 6.3 presents forms of reinforcement that can be especially effective at various grade levels.

A second noteworthy developmental trend is also evident in Table 6.3: As children get older, they become better able to handle **delay of gratification**. That is, they can forego small, immediate reinforcers for the larger reinforcers that their long-term efforts may bring down the road (Atance, 2008; Steinberg et al., 2009). Whereas a preschooler or kindergartner is apt to choose a small reinforcer available *now* rather than a larger and more attractive reinforcer they can't get until tomorrow, an 8-year-old may be willing to wait a day or two for the more appealing item. Many adolescents can delay gratification for several weeks or even longer.

Some children and adolescents are better able to delay gratification than others. Those who are willing and able to postpone reinforcement are less likely to yield to temptation, more carefully plan their future actions, and achieve at higher levels at school (Bembenutty & Karabenick, 2004; Rothbart, 2011; Shoda et al., 1990). However, even 4- and 5-year-olds can learn to delay gratification for a few hours if their teachers tell them that rewards for desired behaviors (e.g., sharing toys with peers) will be coming later in the day and if they're engaging in enjoyable activities in the interim (Fowler & Baer, 1981; Ghaemmaghami et al., 2016; Newquist et al., 2012). Teaching children effective waiting strategies—for instance, focusing attention on something else during the delay and using such self-talk as "If I wait a little longer, I'll get something

DEVELOPMENTAL TRENDS

Table 6.3 Effective Reinforcers at Different Grade Levels

Grade Level	Age-Typical Characteristics	Example	Suggested Strategies

K–2	• Preference for small, immediate reinforcers over larger, delayed ones
	• Examples of effective reinforcers:
	  • Concrete reinforcers (e.g., stickers, new crayons)
	  • Teacher approval (e.g., smiles, praise)
	  • Privileges (e.g., going to lunch first)
	  • "Grown-up" responsibilities (e.g., taking notes to the main office)
		When a kindergarten teacher asks children to choose between a small snack before morning recess or a larger one after recess, most of them clamor for the smaller, immediate snack.	• Give immediate praise for appropriate behavior.
			• Describe enjoyable consequences that will come later as a result of students' current behaviors.
			• Use stickers, handwritten smiley faces, and the like to reinforce students' efforts on written work.
			• Rotate enjoyable classroom jobs (e.g., feeding the goldfish, watering plants); make such jobs contingent on appropriate behavior.

3–5	• Increasing ability to delay gratification
	• Examples of effective reinforcers:
	  • Concrete reinforcers (e.g., snacks, pencils, small toys)
	  • Teacher approval and positive feedback
	  • "Good citizen" certificates
	  • Free time (e.g., to draw or play games)
		Nine-year-old Li-Mei glows with pride when her teacher praises her for helping a classmate with a challenging writing assignment.	• Use concrete reinforcers only occasionally, perhaps to add novelty to a class activity.
			• Award a certificate to a Citizen of the Week, explicitly identifying things the recipient has done especially well; be sure that every student gets at least one certificate during the school year.
			• Plan a trip to a local amusement park for students with good attendance records (especially useful for students at risk for academic failure).

6–8	• Increasing desire to have social time with peers
	• Examples of effective reinforcers:
	  • Free time with friends
	  • Acceptance and approval from peers
	  • Teacher approval and emotional support (especially critical after the transition to middle school)
	  • Specific positive feedback about performance (preferably given in private)
		Students in a sixth-grade science class work diligently on an assigned lab activity, knowing that if they complete it before the end of class, they can have a few minutes to talk about nonacademic matters with their classmates.	• Make short periods of free time with peers contingent on accomplishing assigned tasks.
			• Spend one-on-one time with students, especially those who appear to be socially isolated.
			• Provide explicit feedback about what students have done well (e.g., their prosocial behaviors with classmates).

9–12	• Increasing ability to postpone immediate pleasures in order to gain desired long-term outcomes
	• Concern about getting good grades
	• Examples of effective reinforcers:
	  • Opportunities to interact with friends
	  • Specific positive feedback about performance
	  • Positions of responsibility (e.g., being student representative to the Faculty Senate)
		When 16-year-old Deon's friends ask him to go to the movies on a Thursday evening, he declines. "I have to study for tomorrow's history test," he tells them. "If I keep my grades up, I'll have a better chance of getting a college scholarship."	• Acknowledge students' concerns about earning good grades, but focus their attention on the value of learning for its own sake.
			• Be sure that good grades are contingent on students' own work; take precautions to ensure that cheating and plagiarism are *not* reinforced.
			• Publicize accomplishments of extracurricular groups and athletic teams in local news media.
			• Provide opportunities for independent decision making and responsibility, especially when students show an ability to make wise decisions.

SOURCES: Anderman & Mueller, 2010; Anderman et al., 2002; Atance, 2008; Cizek, 2003; Fowler & Baer, 1981; Green et al., 1994; Hine & Fraser, 2002; Krumboltz & Krumboltz, 1972; Rimm & Masters, 1974; Rotenberg & Mayer, 1990; Sanders, 1996; Steinberg, Graham, et al., 2009; Urdan & Mestas, 2006; Wang & Holcombe, 2010.

better"—enhances their ability to postpone gratification as well (Binder et al., 2000). Yet children must also feel confident that their teachers will actually follow through with the promised goods (Kidd et al., 2013).

When working with young children, try to reinforce desired behaviors immediately, even if only by pointing out that a desired consequence will come later.

The Various Forms that Punishment Can Take

Historically, the use of punishment in schools has been controversial, and in fact, some forms of punishment do a great deal of harm. But under certain conditions, punishing consequences can be both effective and appropriate, especially when students seem to have little motivation to change their behavior for the better.

Remember that the difference between a reinforcer and punishment: a reinforcer (either positive or negative) increases a behavior, whereas punishment is used to decrease behaviors. All punishments fall into one of two categories. **Presentation punishment** involves presenting a new stimulus, presumably something that a learner finds unpleasant and doesn't want. Scoldings and teacher scowls—*if* they lead to a reduction in the behavior they follow—are examples of presentation punishment.

Removal punishment involves removing an existing stimulus or situation, presumably one that a learner finds desirable and doesn't want to lose. Loss of a privilege, a fine or penalty (involving the loss of money or previously earned points), and grounding (i.e., restriction from certain pleasurable outside activities) are examples of removal punishment. People often use the term *negative reinforcement* when they're really talking about punishment. Remember, negative reinforcement is *reinforcement*, which increases a response, whereas punishment has the opposite effect. Table 6.4 can help you understand the distinction.

Consequences that Serve as Effective Punishment As a general rule, we should use only mild forms of punishment. Here are some examples of mild consequences that can be effective in reducing undesirable classroom behaviors:

- A *verbal reprimand* is a brief statement communicating the message that a particular behavior is unacceptable and must stop. Although some students like the attention that a verbal reprimand can bring them (as James does in the opening case study), most students find verbal reprimands to be unpleasant and punishing. In general, reprimands are most effective when they're immediate, brief, unemotional, and, ideally, given quietly and in private.
- A *logical consequence* is something that follows naturally or logically from a student's misbehavior; in other words, it's punishment that fits the crime. For example, if a student destroys a classmate's possession, a reasonable consequence is for the student to replace it or pay for a new one.
- A **time-out** is a specified period of time in which a student has no opportunity to receive the kinds of reinforcement to which classmates have access. For example, it might involve asking students to sit away from other students, where they must quietly watch an enjoyable activity in which classmates are participating. For more significant infractions, it might involve placing a student for a short time in a separate place that's dull and boring—perhaps a remote corner of the classroom.

COMPARE/CONTRAST

Table 6.4 Distinguishing among Positive Reinforcement, Negative Reinforcement, and Punishment

Desired Outcome	Consequence	Effect	Examples
Increase a Behavior	**Positive reinforcement**	Response *increases* when a new stimulus (one the learner finds desirable) is *presented*.	• A student *is praised* for writing in cursive. She begins to write other assignments in cursive as well. • A student *gets lunch money* by bullying a girl into surrendering hers. He begins bullying his classmates more frequently.
	Negative reinforcement	Response *increases* when a previously existing stimulus (one the learner finds undesirable) is *removed.*	• A student *no longer has to worry* about a research paper that he completed several days before the due date. He begins to do his assignments ahead of time whenever possible. • A student *escapes a teacher's wrath* by lying about her role in recent school vandalism. After this incident she begins lying to teachers whenever she finds herself in an uncomfortable situation.
Decrease a Behavior	**Presentation punishment**	Response *decreases* when a new stimulus (one the learner finds undesirable) is *presented.*	• A student *is scolded* for taunting other students. She taunts others less frequently after that. • A student *is ridiculed by classmates* for asking what they perceive to be a stupid question during a lesson. He stops asking questions in class.
	Removal punishment	Response *decreases* when a previously existing stimulus (one the learner finds desirable) is *removed.*	• A student *is removed from the softball team for a week* for showing poor sportsmanship. She rarely exhibits poor sportsmanship in future games. • A student *loses points on a test* for answering a question in a creative but unusual way. He takes fewer risks on future tests.

- *In-school suspension* involves placing a student in a separate room with close adult supervision for one or more days. The student spends each day working on regular class assignments but has little or no opportunity for interaction with peers—an aspect of school that's reinforcing for most students.

An additional consequence worth noting is **response cost**—the loss either of a previously earned reinforcer or of an opportunity to obtain reinforcement. Response cost is especially effective when used in combination with reinforcement of appropriate behavior and when learners who make a few missteps within an overall pattern of desirable behavior lose only a *little bit* of what they've earned (Donaldson et al., 2014; Hirst et al., 2016; Landrum & Kauffman, 2006).

Forms of Punishment that May Undermine Desired Behavior Changes Several forms of punishment are typically *not* recommended because they have adverse side effects, convey a counterproductive message, or actually serve as reinforcers for some students. For example, most experts advise against *physical punishment* for school-age children, and its use in the classroom is *illegal* in most places. Even mild physical punishment, such as a spank or slap with a ruler, can lead to such undesirable outcomes as resentment of the teacher, avoidance of school, lying, aggression, vandalism, and truancy. When carried to extremes, physical punishment constitutes child abuse and can cause long-term physical damage, psychological problems, or both.

Another consequence we should definitely *not* use is **psychological punishment**, which seriously threatens a student's self-esteem. Fear tactics, embarrassing remarks, public humiliation, and social exclusion (e.g., long-lasting ostracism from the group) can lead to some of the same side effects that physical punishment does—for instance, resentment, distraction from schoolwork, and truancy—and can inflict long-term psychological harm. By deflating students' sense of self, psychological punishment can also dampen their interest in learning and expectations for future performance (Brendgen et al., 2007; Ellis et al., 2010; Hyman et al., 2006; Uskul & Over, 2017).

Do *not* use physical punishment, public humiliation, or extra classwork to discourage undesirable behaviors.

A third counterproductive consequence is assigning *extra classwork or homework* as a punishment for one or more students' misbehaviors (Cooper, 1989; Corno, 1996). Such punishment has a very different side effect: It communicates the message that schoolwork is unpleasant.

Finally, *out-of-school suspension* rarely brings about desired behavior changes. For one thing, being suspended from school may be exactly what a student wants, in which case inappropriate behaviors are being reinforced rather than punished. Also, because many students with chronic behavior problems tend to do poorly in their schoolwork, suspension involves a loss of valuable instructional time and can diminish psychological attachment to school. Thus, it decreases students' chances for academic and social success even further and increases the probability that students will drop out before graduation (American Psychological Association Zero Tolerance Task Force, 2008; Christenson & Thurlow, 2004; Gregory et al., 2010; Osher et al., 2010).

Strongly advocate for in-school alternatives to out-of-school suspension.

Consequences with Mixed Reviews Two additional forms of punishment get mixed reviews regarding effectiveness. In some situations, *missing recess* is a logical consequence for students who fail to complete their schoolwork during regular class time because of their off-task behavior. Yet research indicates that, especially at the elementary level, students can more effectively concentrate on school tasks if they have frequent breaks and opportunities to release pent-up energy (Jarrett, 2015; Pellegrini & Bohn, 2005). And although imposing *after-school detention* for serious misbehavior is common practice at many schools, some students simply can't stay after school hours, perhaps because they have transportation issues, must take care of younger siblings at home, or are justifiably afraid to walk through certain neighborhoods after dark (Nichols et al., 1999). Unless we can address such concerns, imposing after-school detention isn't logistically feasible.

Keep in mind the downsides of having students miss recess and imposing after-school detention.

Strategies for Encouraging Productive Behaviors and Discouraging Undesirable Ones

Learning Objective 6.5 Apply behaviorist principles to encourage appropriate and productive behaviors throughout the school day.

Although some unpleasant consequences can reduce undesirable behaviors, most contemporary behaviorists suggest that we emphasize the positive, looking for and reinforcing what's *right* with students' behaviors. For instance, as teachers, we must be sure that productive student behaviors (e.g., completing assignments on time and working cooperatively with peers) typically lead to either intrinsic or extrinsic reinforcement. Meanwhile, we should be careful *not* to reinforce counterproductive behaviors. If we repeatedly allow Maddie to turn in assignments late because she says she "forgot" her homework and if we often let Caleb get his way by bullying his peers, then we're reinforcing and thus potentially *increasing* Maddie's irresponsibility and Caleb's aggressiveness.

Be careful that you don't inadvertently reinforce undesirable behaviors.

In the next few pages, we'll translate behaviorist principles into a variety of strategies for encouraging productive behaviors and—often indirectly—also reducing counterproductive ones.

Using Reinforcement Effectively

The following strategies are consistent with behaviorist principles and research findings:

- *Specify desired behaviors at the outset*. Before beginning a lesson, behaviorists urge us to identify the desired end results in specific, concrete, observable terms. In doing so, we give both ourselves and our students targets to aim for, and we can better determine whether everyone is making progress toward them. For example, rather than talk about the need for students to "Study world history," we might instead talk about them being able to "Describe the antecedents and outcomes of World War II." Rather than say that students should "Learn responsibility," we might instead talk about their need to "Follow instructions, bring the necessary books and supplies to class each day, and turn in assignments by their due dates."

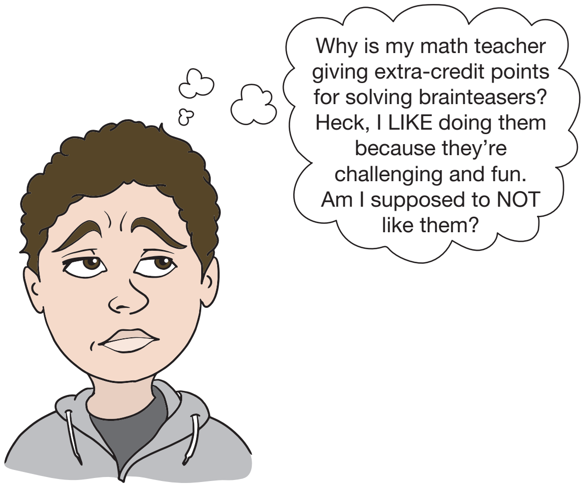
  Keep in mind, however, that reinforcement only for accomplishing a certain task, perhaps at a minimally acceptable level, may focus students' attention and effort more on completing the activity than on *learning* from it. For this reason, we may often need to specify the *quality* of the desired behaviors. Especially if we want students to engage in complex cognitive processes—for example, to think critically and creatively about a topic—extrinsic reinforcement simply for task accomplishment can be counterproductive (Anderman & Anderman, 2014; Deci & Ryan, 1985; McCaslin & Good, 1996).

  Educators are increasingly recognizing the importance of spelling out in advance the most important things that students should learn and achieve. You're apt to see a variety of terms for this idea—perhaps *instructional goals*, *objectives*, *outcomes*, *competencies*, *benchmarks*, and *standards.*
- *Make sure that all students regularly receive reinforcement for desired behaviors.* In the opening case study, James engages in a variety of inappropriate behaviors as a means of gaining other people's attention. We might reasonably guess that James would prefer more pleasant interactions with adults and peers, yet for whatever reasons he seldom has such interactions—perhaps because his academic performance rarely gains his teacher's praise or perhaps because he lacks the social skills to make and maintain friendships. In working with James, his teacher should identify the academic and social skills he might be missing, help him acquire those skills, and then reinforce him for using them.

In our attempts to improve the behaviors of some students, we must be careful that we don't unintentionally slight other, equally deserving students. Furthermore, we must keep in mind that some students may be unable to exhibit particular behaviors through little or no fault of their own. Consider the case of an immigrant student who had to adjust very quickly from a 10:00–5:00 school day in Vietnam to a 7:45–3:45 school day in the United States:

> Every week on Friday after school, the teacher would give little presents to kids that were good during the week. And if you were tardy, you wouldn't get a present. . . . I would never get one because I would always come to school late, and that hurt at first. I had a terrible time. I didn't look forward to going to school. (Igoa, 1995, p. 95)

Ultimately, school should be a place where *all* students can, in one way or another, earn reinforcement for appropriate behaviors and academic progress.


Why is my math teacher giving extra-credit points for solving brainteasers? Heck, I LIKE doing them because they're challenging and fun. Am I supposed to NOT like them?

Extrinsic reinforcement of an activity that students already find intrinsically reinforcing may undermine their enjoyment of the activity.

- *Use extrinsic reinforcers only when desired behaviors will not otherwise occur.* It's neither possible nor necessary to provide extrinsic reinforcement for every good deed. Furthermore, many extrinsic reinforcements lose their effectiveness when used repeatedly (Michael, 2000; Murphy et al., 2003). The best reinforcers are intrinsic ones, such as the pleasure one gets from reading, the pride one feels after completing a challenging task, and the internal satisfaction one feels while helping others. Students willingly engage in activities that are enjoyable or pique their curiosity, and they'll readily behave in ways that lead to feelings of mastery and accomplishment.

  You should be aware, too, that *extrinsic reinforcement of an activity that students already find intrinsically reinforcing may undermine their enjoyment of the activity.* Some research indicates that enjoyable activities can be increased through extrinsic reinforcement, but will then *decrease* to a very low level once the reinforcers are removed. Extrinsic reinforcers are particularly likely to have this adverse effect when students perceive them as being controlling or manipulative, rather than as promoting improvement and mastery (Deci & Moller, 2005; Lepper & Hodell, 1989; Reeve, 2006). *If a student is already engaging in an activity, reinforcement is rarely necessary or advised.*

  Yet many of the tasks students tackle in school—perhaps writing a persuasive essay or learning how to play a clarinet—can be difficult and frustrating, especially at first. When students struggle with a task and encounter frequent failure, we should probably provide some extrinsic reinforcement (e.g., praise, free time) for small improvements. And when we find that we must break a complex task into small pieces that are easier to accomplish but less fulfilling in their own right—for instance, drill-and-practice activities that foster automaticity for basic math facts—we may need to reinforce a lot of small, seemingly trivial successes. However, once students have mastered tasks and skills to levels that bring them feelings of genuine accomplishment, extrinsic reinforcers should no longer be necessary (Deci et al., 2001; Hidi & Harackiewicz, 2000).

Communicate genuine appreciation for what students have done. Try not to come across as controlling or manipulative.

Extrinsic reinforcement for students who don't need it can undermine their intrinsic motivation (see Chapter 10).

- *Determine whether particular "reinforcers" are truly reinforcing for students.* Different students have different needs and desires—factors that underlie their *motivation*—that influence the effectiveness of various reinforcers. Accordingly, the use of reinforcement is far more productive when reinforcers are tailored to individual students. In some cases, we can let students choose their *own* reinforcers and perhaps choose different reinforcers on different occasions. Children seem to prefer having some choice about the reinforcers for which they work (Brandt et al., 2015; Sran & Borrero, 2010; Ulke-Kurcuoglu & Kircaali-Iftar, 2010).

One useful strategy for a class with many chronic misbehavers is a **token economy**, in which students who exhibit desired behaviors receive tokens—perhaps specially printed "class dollars" or teacher-initialed checkmarks on a slip of paper—that they can collect and later use to "purchase" a variety of *backup reinforcers*—perhaps small treats, free time in a reading center, or a prime position in the lunch line. Often, the tokens become effective reinforcers in and of themselves. Perhaps they become secondary reinforcers through repeated association with other reinforcing objects and events, or perhaps they're effective simply because they provide feedback that students are doing something well.

Generally, however, we should stay away from concrete reinforcers as much as possible. Such reinforcers can be expensive and distract students' attention away from their schoolwork. Fortunately, many less tangible reinforcers—such as positive feedback, special privileges, and favorite activities—can be quite effective with school-age children and adolescents (e.g., Feltz et al., 1999; Homme et al., 1963; Kelley & Carper, 1988). The Creating a Productive Classroom Environment feature "Identifying Effective Reinforcers for Different Students" offers some widely recommended strategies.

Use concrete reinforcers only if less tangible reinforcers are ineffective.

- *Make response–consequence contingencies explicit.* Reinforcement is typically more effective when students know exactly which behaviors will lead to which consequences. For example, kindergarten students are more likely to behave appropriately if they're told, "The quietest group will be first to get in line for recess."

  One concrete way of communicating both behavioral expectations and response–reinforcement contingencies is a **contingency contract**. To develop such a contract, the teacher meets with a student to discuss a problem behavior (e.g., talking to friends during independent seatwork, speaking disrespectfully to classmates). The teacher and the student then identify and agree on desired behaviors that the student will demonstrate (e.g., completing seatwork assignments within a certain time frame, speaking with classmates in a friendly and respectful manner). The two also agree on one or more reinforcers (e.g., points earned toward a particular prize or privilege). Together the teacher and the student write and sign a contract that describes the desired behaviors and contingent reinforcers. Contingency contracts can be highly effective in improving a variety of academic and social behaviors (Kehle et al., 2000; Lane et al., 2011; Wilkinson, 2003).

- *Create conditions in which students can reinforce one another for academic achievements and productive behaviors.* In truly productive classrooms, not only teachers but also *peers* reinforce students for their efforts and achievements. Perhaps the most effective strategy here is to specifically *teach* students how to compliment one another for good work—for instance, by giving one another high-fives or fist-bumps (e.g., Beaulieu et al., 2013).

  In some cases, peer reinforcement might be one of the benefits of a **group contingency**, in which students are reinforced only when *everyone* in a particular group—perhaps even an entire class—achieves at a certain level or behaves appropriately. For example, a fifth-grade teacher arranges her students into small groups to discuss some recent current events. When all the group members actively contribute to the discussion, everyone in the group is given 10 minutes of extra recess time.

When imposing a group contingency, make sure that everyone in the group is capable of making the desired responses.

Group contingencies can be effective in improving academic achievement and behavior *if* everyone in the group is capable of making the desired responses (Cariveau & Kodak, 2017; Heck et al., 2001; Pigott et al., 1986; Robinson & Griesemer, 2006). In addition to the reinforcers that teachers explicitly provide, peer pressure, social reinforcers, and peer scaffolding seem to play roles here. Many students encourage misbehaving classmates to behave appropriately and then reinforce those who do so. Furthermore, when students' own success is riding on the success of their peers, students who have mastered a topic may begin to tutor students who are struggling. Whenever we use

Creating a Productive Classroom Environment

Identifying Effective Reinforcers for Different Students

- **Don't use reinforcers for activities that students already are doing and enjoy.**

  Miss Smith is a fifth-grade teacher. She decides to implement a program in which students will get rewarded with a ticket that they can later redeem for a prize (e.g., a treat) for every book that they read independently. Mr. Haines, another fifth-grade teacher, realizes that there is no need to give out these tickets. His students already happily read on their own and love to talk about the new books that they have read.

- **Give students choices among two or more alternatives.**

  A high school teacher is working with a boy who has a significant intellectual disability and chronic behavior problems. On various occasions, she gives him different choices about which of two things he'd prefer to do. For example, she might give him a choice between (a) talking with her versus playing alone with favorite items, (b) working with her on an assigned task versus sitting by himself with nothing to do, or (c) working with her on an assigned task versus playing alone with favorite items. From the student's pattern of choices, the teacher concludes that her attention is an effective reinforcer for the student.

- **Ask students (or perhaps their parents) about reinforcers they would find especially appealing.**

  A first-grade teacher always includes his students in parent–teacher conferences. At one such conference, the teacher expresses his delight about the progress a student has made in the last few weeks but adds, "I've seen a lot of inconsistency in Janie's performance. Sometimes she works very hard, but at other times she doesn't put much effort into her schoolwork, and occasionally she doesn't complete assignments at all." Together the teacher, Janie, and her parents agree that successfully completed assignments will earn her points toward the bicycle she has been asking her parents to buy for her.

- **Make highly enjoyable activities contingent on the completion of important but possibly less enjoyable tasks.**

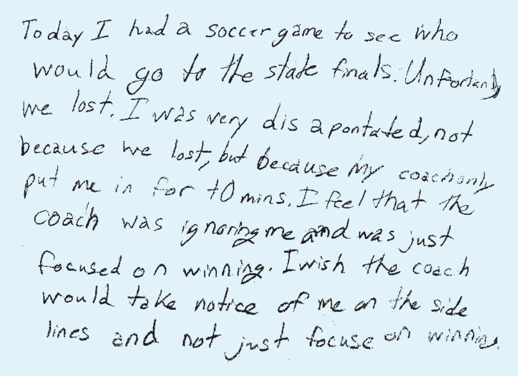
  After class, a ninth-grade teacher praises a student for his desire to make other people laugh. Then she points out the downside of his sense of humor: "Unfortunately, your jokes can distract your classmates from what they're supposed to be doing, and sometimes I have a hard time getting discussions back on topic." She promises the student that if he can keep his attention and remarks focused on subject matter throughout a class period, she'll give him the last two or three minutes of the period to tell the class a joke or two.

- **Provide a small amount of free time contingent on desired behaviors.**

  A fifth-grade teacher allows students to engage in favorite activities during the free time they earn each day. Some students work on laptops, others work on art projects, and still others play board games in which they can practice basic math or literacy skills.

- **Observe students' behaviors and written work, keeping a lookout for activities and consequences that students seem to appreciate.**

  At home one night, 11-year-old Amie writes the entry below in the class journal that she and her teacher regularly use to communicate. The entry reveals that Amie clearly enjoys playing soccer; in other words, soccer is intrinsically reinforcing for her. It appears, too, that Amie appreciates attention from her coach, probably because (a) he might let her play more and (b) she would like feedback about what she's doing well and how she might improve her skills.



Today I had a soccer game to see who
would go to the state finals. Unfortanly
we lost. I was very disapontated, not
because we lost, but because my coach only
put me in for 10 mins. I feel that the
coach was ignoring me and was just
focused on winning. I wish the coach
would take notice of me on the side
lines and not just focuse on winning.

Source of student with disability artifact example: Berg et al. (2007). Comparing functional analysis and paired-choice assessment results in classroom settings. *Journal of Applied Behavior Analysis, 40,* 545–552.

group contingencies, however, we must closely monitor students' behaviors to make sure that any peer pressure is socially appropriate—for instance, that students aren't ridiculing or bullying their lower-performing classmates.

- *Monitor students' progress.* Whenever we use reinforcement as a primary strategy for increasing desired behaviors—especially with students who have historically been performing poorly—we should ideally determine whether our efforts are bringing about the desired results. Behaviorists recommend that we assess the frequency of the desired behavior both before and during our attempts to increase it. The frequency of a behavior *before* we intentionally begin reinforcement is its

baseline level. Some behaviors occur frequently even when they're not being explicitly reinforced; others occur rarely or not at all.

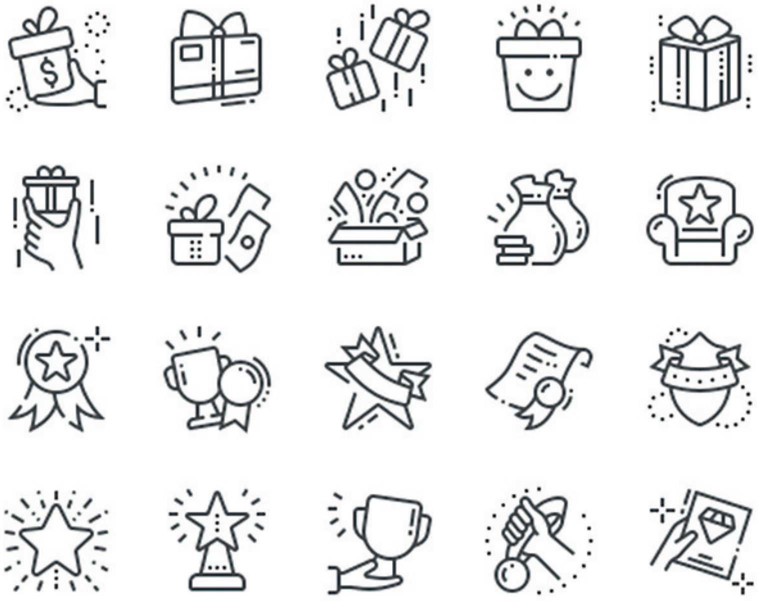
By comparing the baseline frequency of a response with its frequency after we begin to reinforce it, we can determine whether our strategy is actually having an effect. As an example, let's look once again at James in the opening case study. He rarely turns in assignments: This is a behavior with a low baseline. An obvious reinforcer to use with James is attention—a consequence that, until now, has effectively reinforced such counterproductive behaviors as making inappropriate comments in class and throwing objects across the room. When we make our attention contingent on James's turning in assignments, rather than on his refusing to do so, we might see an almost immediate increase in the number of assignments we receive from James. But if we see no significant change, we might need to consider alternative reinforcers. We should also consider and address possible reasons—perhaps poor reading skills—why he might be trying to avoid his schoolwork.

- *Consider using mechanical or digital technologies as a means of administering reinforcement and monitoring its effects.* Many small digital devices and smartphone applications enable teachers to reinforce productive behaviors in students with chronic behavior problems (you can find examples on the internet by using a keyword phrase such as "mobile phone apps behavior management"). Simple mechanical clickers can help both teachers and students to monitor the frequency with which the students exhibit certain desired responses. And some internet-based instructional programs provide "virtual" reinforcers as students make progress in acquiring basic academic skills.
- *Administer reinforcement consistently until the desired behavior occurs at a desirable rate.* Desired responses increase more quickly when they're reinforced every time they occur—that is, when the responses lead to *continuous reinforcement*. Continuous reinforcement is most important when students are first learning new behaviors, perhaps when they begin a new school year or when they must tackle a challenging new task. In some instances, we may need to begin by reinforcing *effort* (e.g., time on task) and switch to reinforcing *accuracy* only after students have gained some proficiency (Lannie & Martens, 2004).
- *Once a behavior is well established, gradually—but only gradually—wean students from extrinsic reinforcement.* Just as reinforced behaviors increase in frequency, *non*reinforced behaviors often *de*crease in frequency, and may eventually disappear altogether. Like the decrease of a conditioned response in classical conditioning, the decrease and eventual disappearance of a nonreinforced response in instrumental conditioning is known as *extinction*.

After students have begun to exhibit a desired behavior regularly, continue to reinforce it intermittently to encourage persistence and prevent extinction.

Intrinsic reinforcement can, of course, maintain many productive behaviors over the long run, both at school and in the outside world. But as previously noted, students don't necessarily find *all* desired behaviors enjoyable in and of themselves. When certain behaviors have no intrinsic appeal, intermittent reinforcement provides a viable alternative. Once students have mastered a desired behavior and are using it regularly, then, we should continue to reinforce it intermittently, especially if it has no intrinsically reinforcing effect.

When used purposefully and systematically, reinforcement can be an effective means of encouraging productive behaviors—*provided that* students have the physical, cognitive, and neurological capabilities necessary for performing the behaviors. For example, some children with physical disabilities may have insufficient physical stamina to attend to classroom activities for lengthy time periods. And in the opening case study, perhaps James has poor reading skills that, because of shame or embarrassment, he wants to hide from his teacher and classmates. If so, he may sometimes misbehave to escape tasks that, to him, seem impossible. In some instances, we may need to supplement our use of reinforcement with individually



There are many types of reinforcers that can be used as rewards to encourage certain behaviors. The specific reinforcer should be used sparingly and should be developmentally matched with students' grade levels.

tailored instruction, scaffolding, or modifications—typically by bringing strategies based on cognitive, contextual, or social cognitive theories of learning (which we will discuss in the next few chapters) into the picture.

Determine whether physical, cognitive, or neurological factors may be interfering with students' ability to acquire certain behaviors or skills. When such factors are in play, use reinforcement only in combination with other instructional or classroom-management strategies.

Shaping New Behaviors

What if a desired behavior has a baseline level of *zero*? How can we encourage a behavior that a student never exhibits at all, at least not in its ideal form? In such cases, behaviorists suggest gradually **shaping** the behavior: reinforcing a series of responses—known as *successive approximations*—that increasingly resemble the desired behavior. Shaping involves these steps:

1. Reinforce any response that in some way resembles the desired behavior.
2. Reinforce a response that more closely approximates the desired behavior (while no longer reinforcing the previously reinforced response).
3. Reinforce a response that resembles the desired behavior even more closely.
4. Continue reinforcing closer and closer approximations to the desired behavior.
5. Reinforce *only* the desired behavior.

Shape a low-frequency behavior by reinforcing closer and closer approximations over time.

Each response in the sequence is continuously reinforced until it occurs regularly. Only at that point do we begin reinforcing a behavior that more closely approaches the desired end result. As an example, imagine that we have a second grader who can't seem to sit still long enough to get anything done. We may actually want her to sit still for 20-minute periods, but we might first have to reinforce her for staying in her seat for just 2 minutes, gradually increasing the required sitting time as she makes progress.

We can often use shaping to help students acquire complex physical and psychomotor skills. For example, in the early elementary grades, teachers gradually shape students' handwriting skills—for instance, expecting increasingly small and well-shaped letters. And in secondary schools, physical education teachers and coaches may teach and expect increasingly proficient athletic skills (Harrison & Pyles, 2013; Stokes et al., 2010b).

In much the same way, we can use shaping—and teachers often do so—to teach students to work independently on assignments. We begin by giving first graders structured tasks that may take only 5 to 10 minutes to complete. As students move through the elementary school years, we expect them to work independently for longer periods and begin to give them short assignments to do at home. By the time students reach high school, they have extended study halls and complete lengthy assignments on their own after school hours. In the college years, student assignments require a great deal of independence and self-direction.

Encouraging Desired Behaviors through Antecedent Stimuli and Responses

In our discussion of reinforcement so far, we've focused on the *consequences* of behaviors. But stimuli and responses that *precede* a desired behavior—**antecedent stimuli** and **antecedent responses**—can have effects as well. Here we'll look at several phenomena that involve antecedent stimuli, as well as one phenomenon (behavioral momentum) that involves antecedent responses.

Cueing Students are more likely to behave appropriately when they get reminders—often called *cues* or *prompts*—that certain behaviors are expected. Such **cueing** sometimes involves a nonverbal signal, such as flicking overhead lights off and on to remind students to use their "indoor voices." At other times, it involves a verbal reminder about what students should be doing. Subtle hints are often effective for older students (e.g., "I see some art supplies that still need to be put away"), whereas more explicit hints may be necessary for younger children (e.g., "Table 3 needs to clean up its art supplies before it can go to lunch").

Quickly and unobtrusively cue students about appropriate behaviors, perhaps through a flick of the light switch or brief verbal reminder.

Setting Events In cueing, we use specific stimuli to prompt students to behave in particular ways. An alternative approach is to create an overall environment—a **setting event**—that's apt to evoke desired behaviors. For example, young children are more likely to interact with peers during free-play time if they have a relatively small area in which to play and if the toys available to them (e.g., balls, puppets) encourage cooperation and group activity (Brown et al., 1987; Frost et al., 1998; Martin et al., 1991). Similarly, the nature of the games children are asked to play influences the behaviors they exhibit: Cooperative games promote cooperative behavior, whereas competitive games promote aggressive behavior (Bay-Hinitz et al., 1994).

Create an environment in which desired behaviors are more likely to occur of their own accord.

Generalization Once children have learned that a response is likely to be reinforced in one set of circumstances (which serve as antecedent stimuli), they're apt to make the same response in similar situations. In behaviorist terminology, the children show *generalization*. For example, after an especially fidgety student has learned to sit quietly and attentively for 20-minute periods in her second-grade class, she may generalize that behavior to her third-grade class the following year. As is true for other, more cognitive forms of transfer (see Chapter 8), generalization of newly acquired behaviors is most likely to occur when students have opportunities to practice them in diverse settings (Alberto & Troutman, 2017; Haring & Liberty, 1990; Johnson et al., 2006).

Provide opportunities for students to practice desired behaviors in a variety of settings.

In one sense, generalization in instrumental conditioning should remind you of the generalization that occurs in classical conditioning: In both cases, an individual learns a response to one stimulus and then responds in the same way to a similar stimulus. A key difference is one of learner control: Generalization involves an automatic, involuntary response in classical conditioning, but a voluntary response in instrumental conditioning.

Discrimination Sometimes responses are reinforced *only* when certain environmental conditions—that is, certain antecedent stimuli—are present. This ability to distinguish between conditions in which a particular behavior will and won't be reinforced is known as **discrimination**. For example, adolescent males should certainly learn that slapping a peer on the back might be quite acceptable when celebrating an athletic victory with teammates but it is *not* acceptable when greeting a female classmate in the hall. Some students may need explicit guidance about the circumstances in which particular behaviors are and are not likely to be reinforced.

It's occasionally helpful to use cueing to assist students in determining when certain behaviors are permissible. For example, in one study, children in three elementary classrooms were having trouble determining when they could and could not request a teacher's assistance. Their teachers began to wear green and red leis at different times and told them, "While I am wearing the green lei, I will be able to answer your questions. While I am wearing the red lei, I will not be able to answer your questions." This simple procedure minimized student requests at inopportune moments (Cammilleri et al. 2008, p. 301; also see Nava et al., 2016).

Describe conditions under which certain behaviors are appropriate and reinforce the behaviors *only* when they're appropriate.

Behavioral Momentum In some instances, students are more likely to make desired responses if they're already making similar responses—a phenomenon known as **behavioral momentum**. For example, imagine that we have low-achieving adolescents who have a history of refusing to do math assignments. Such students are more likely to attempt difficult three-digit multiplication problems after they've first worked on a few simple one-digit problems (Belfiore et al. 1997). Similarly, we might ask students to tidy up a messy classroom after they've already cleaned their own desktops, or to try a backward roll after they've successfully executed a forward roll. In general, we can promote behavioral momentum by assigning relatively easy or enjoyable tasks that lead naturally into more complex and potentially frustrating ones.

Take advantage of behavioral momentum, assigning easy tasks as a lead-in to similar but more challenging ones.

Creating Conditions for Extinction

Identify and try to remove reinforcers that might be maintaining an undesirable behavior.

One way to reduce the frequency of an inappropriate response is simply to make sure it's never reinforced. For example, a class clown whose antics are ignored might stop distracting his classmates.

There are several points to keep in mind about extinction, however. First, once reinforcement stops, a previously reinforced response may initially *increase* for a short time (Lerman & Iwata, 1995; McGill, 1999). For example, imagine you have a household appliance (e.g., a clothes dryer) that works only when you bang on it once or twice. At some point, something changes inside your dryer that makes the banging ineffective; because you don't realize this at first, you bang it *many times and very hard* before you finally give up. In much the same way, students whose inappropriate behaviors have previously been reinforced may begin to behave even *less* appropriately once their original behaviors are no longer working for them. Fortunately, such increases in misbehavior are usually temporary, but they can certainly try our patience and perhaps tempt us into paying attention to—and thereby inadvertently reinforcing—the more extreme responses.

Second, if we ignore a student's misbehavior in an effort to extinguish it, we must be sure that we don't ignore the student altogether. Instead, we should give a misbehaving student attention for doing things *well*, and perhaps also at random intervals throughout the school day (Austin & Soeda, 2008; Richman et al., 2015).

Third, we may sometimes have situations in which removing a reinforcer has no noticeable effect on a student's counterproductive behavior. Perhaps the behavior has previously been reinforced only intermittently, thus making it fairly resistant to extinction (recall the earlier Molly-and-Maria example). Or perhaps the behavior is being reinforced in other ways—say, by classmates' attention or the release of pent-up energy. In such cases, one or more of the strategies that follow are probably in order.

Cueing Inappropriate Behaviors

Just as we can use cueing to remind students about what they should be doing, we can also cue them about what they should *not* be doing. For example, we might use *body language*—perhaps making eye contact and raising an eyebrow—or *physical proximity*—moving closer to the student and standing there until the problem behavior stops. When subtlety doesn't work, a brief *verbal cue* may be in order—perhaps stating a student's name or (if necessary) pointing out an inappropriate behavior (e.g., "Lucy, put away your cell phone").

Use physical or verbal cues to discourage inappropriate behaviors.

Reinforcing Incompatible Behaviors

Often, we can reduce the frequency of an unproductive behavior simply by reinforcing an *alternative* behavior. Ideally, the two behaviors are **incompatible behaviors**, in that they cannot both be performed at the same time. For example, try the following exercise.

Experiencing Firsthand

Asleep on Your Feet

Have you ever tried to sleep while standing up? Horses can do it, but most of us humans really can't. In fact, there are many pairs of responses that are impossible to perform simultaneously. Take a minute to identify something you can't possibly do when you perform each of these activities:

When you . . .	You cannot simultaneously . . .
Sit down	____________________________
Eat crackers	____________________________
Check messages on your cell phone	____________________________

Obviously, there are many possible right answers. For instance, sitting is incompatible with standing. Eating crackers is incompatible with singing—or at least with singing *well*. Checking your cell phone for new messages is incompatible with paying attention to a class lecture. In each case, it's impossible to perform both activities at exactly the same time.

When our attempts at extinction or cueing are unsuccessful, reinforcement of one or more behaviors that are incompatible with a problem behavior can often be quite effective (Lane et al., 2006; Payne & Dozier, 2013; Pipkin et al., 2010). This is the approach we're taking when we reinforce a hyperactive student for sitting quietly: Sitting is incompatible with getting-out-of-seat and roaming-around-the-room behaviors. It's also an approach we might use to deal with forgetfulness (we reinforce students when they remember to do what they're supposed to do), being off-task (we reinforce on-task behavior), and verbal abusiveness (we reinforce prosocial statements). And consider how we might deal with a chronic litterbug (Krumboltz & Krumboltz, 1972):

Encourage and reinforce responses that are incompatible with undesirable behaviors.

> Walt often leaves banana peels, sunflower seed shells, and other garbage in and outside the school building. When the school faculty establishes an Anti-Litter Committee, it puts Walt on the committee, and the committee eventually elects him as its chair. Under Walt's leadership, the committee institutes an anti-litter campaign, complete with posters and lunchroom monitors, and Walt receives considerable recognition for the campaign's success. Subsequently, school personnel no longer find Walt's garbage littering the building and school grounds.

Using Punishment When Necessary

Some misbehaviors require an immediate remedy—for instance, they might interfere significantly with learning or reflect total disregard for other people's rights and welfare. Consider this example:

> Bonnie doesn't handle frustration well. Whenever she encounters an obstacle she can't immediately overcome, she hits, punches, kicks, or breaks something. During a class Valentine's Day party, she accidentally drops her cupcake. When she discovers that it's no longer edible, she throws her milk carton across the room, hitting another child on the head.

Bonnie's troublesome behaviors are hard to extinguish because they aren't being reinforced to begin with—at least not extrinsically. Also, there are no obvious incompatible responses that might be reinforced instead. And presumably, Bonnie's teacher has often cued her about her inappropriate behaviors. When other strategies are inapplicable or ineffective, punishment is a potentially viable alternative.

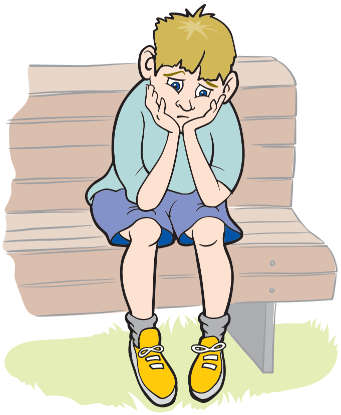
Use punishment when alternative approaches are inapplicable or have been ineffective.

A frequent criticism of punishment is that it's inhumane, or somehow cruel and barbaric. Indeed, certain forms of punishment, such as physical abuse and public humiliation, do constitute inhumane treatment. We must be *extremely careful* when we use punishment in the classroom. If administered judiciously, however, some forms of mild punishment can lead to rapid reductions in misbehavior without causing physical or psychological harm. And when we can decrease counterproductive classroom behaviors quickly and effectively—especially when those behaviors are harmful to self or others—punishment may, in fact, be one of the most humane approaches we can take (Lerman & Vorndran, 2002). Following are several guidelines for using punishment effectively and humanely:

- *Choose a consequence that is truly punishing without being overly severe.* Any unpleasant consequence must be strong enough to discourage students from engaging further in the punished behavior. But unnecessarily harsh punishments—those that far surpass the severity of the crime—are apt to lead to such undesirable side effects as resentment, hostility, aggression, and escape behavior. Furthermore, although severe punishment may quickly suppress a response, that response may reappear at its original level once the punishment is no longer given. The ultimate purpose of administering punishment is to communicate that the limits of acceptable behavior have been exceeded, *not* to exact revenge and retaliation.
- *Inform students ahead of time that certain behaviors will be punished and explain how those behaviors will be punished.* When students are informed of response–punishment contingencies ahead of time, they're less likely to engage in forbidden behaviors, and they're less likely to be surprised or resentful if punishment must be administered (Boyanton, 2010; Moles, 1990). Ultimately, students must learn that their behaviors influence the consequences they experience—that they have some control over what happens to them.
- *Follow through with specified consequences.* A mistake some teachers make is to continually threaten punishment without ever following through. One warning is desirable, but repeated warnings are not. Consider the teacher who says, "If you bring that rubber snake to class one more time, I'll take it away!" but never does take away the snake. This teacher is giving the message that no response–punishment contingency really exists.

Understanding that one's own behaviors influence consequences is an example of an *attribution* (see Chapter 11).

- *Administer punishment privately, especially when other students aren't aware of the transgression.* By administering punishment in private, we protect students from public embarrassment and humiliation. We also eliminate the possibility that the punishment will draw classmates' attention—a potential reinforcer for the very behavior we're trying to eliminate.



Some mild forms of punishment, such as a brief time-out in a quiet corner away from peers, can reduce counterproductive behaviors, but we must monitor their effectiveness for different students.

- *Emphasize that it's the behavior—not the student—that is unacceptable and explain why it's unacceptable.* We must explain exactly why a certain behavior cannot be tolerated in the classroom—perhaps because it interferes with learning, threatens other students' safety, or damages school property. In other words, punishment should be accompanied by **induction** (see Chapter 3). Punishment is far more effective when accompanied by one or more reasons that the punished behavior is unacceptable (Hoffman, 2000; Parke, 1974; Perry & Perry, 1983).
- *Administer punishment within the context of a warm, supportive interpersonal relationship*. Punishment is more effective when the person administering it has previously established a good working relationship with the student (Landrum & Kauffman, 2006; Nucci, 2001). The message should ultimately be this: "I care for you and want you to succeed, and your current behavior is interfering with your success."
- *Simultaneously teach and reinforce desirable alternative behaviors.* Punishment of misbehavior is almost always more effective when appropriate behaviors are being reinforced at the same time. For example, effective in-school suspension programs include instruction in appropriate behaviors and missing academic skills, with the supervising teacher acting as a supportive resource rather than a punisher (Gootman, 1998; Pfiffner et al. 2006; Sullivan, 1989). Furthermore, by reinforcing desirable responses as well as punishing undesirable ones, we give students the positive, optimistic message that, yes, behavior can and will improve. Ultimately, the overall classroom atmosphere we create must be a positive one that highlights the *good* things students do.
- *Monitor the punishment's effectiveness.* Remember that punishment is defined by its effect on behavior. True punishment decreases the response it follows, typically quite rapidly (Landrum & Kauffman, 2006). If a given consequence doesn't decrease the response it's intended to punish, it may not be aversive to the individual being "punished." In fact, it may even be reinforcing.

Reflecting on the Consequences You Either Intentionally or Unintentionally Impose

We have occasionally alluded to the idea that the consequences we impose won't always have the desired effects. Now we make this point more explicitly: *We must frequently examine and critically reflect on the effects that our own actions might actually be having on our students' behaviors.* For example, we should regularly ask ourselves questions such as these:

- Am I reinforcing students for easy achievements when they're quite capable of accomplishing more challenging tasks, perhaps with a little bit of guidance and support?
- Am I reinforcing students for behaviors that they're already doing consistently?
- Are my reprimands and other supposedly "punishing" consequences actually reinforcing some students because these students are eager to get my attention in any form?
- Do some supposedly "punishing" consequences enable students to escape or avoid tasks they would rather not do—thus actually negatively reinforcing students for misbehaviors by removing them from an unpleasant situation?

We must always keep in mind our ultimate goal: to create a classroom environment in which all students make significant progress both in their academic knowledge and skills and in the behaviors that will serve them well in their future in-school and out-of-school lives.

Addressing Especially Difficult Classroom Behaviors

Learning Objective 6.6 Building on behaviorist ideas, describe four systematic approaches to addressing persistent behavior problems.

Behaviorist principles can be extremely helpful in tackling difficult and chronic behavior problems. In this section, we consider four related approaches for addressing especially challenging behaviors. Often these approaches are planned and carried out by one or more teachers in consultation with a school psychologist or other specialist.

Applied Behavior Analysis

Applied behavior analysis (ABA) is a group of procedures that systematically apply behaviorist principles in a concerted, preplanned effort to change one or more individuals' behavior. (You might also see such terms as *behavior modification, behavior therapy,* and *contingency management*.) Applied behavior analysis is based on the assumptions that (a) behavior problems result from past and present environmental conditions and (b) modifying a learner's present environment will promote more productive behaviors.

Consistent with behaviorist traditions, educators who use ABA focus on specific, concrete responses, which they call **target behaviors**. Sometimes, interventions are aimed at increasing certain (presumably desirable) target behaviors. At other times interventions are designed to decrease certain (presumably undesirable) target behaviors.

When teachers and therapists use ABA to help a student acquire more appropriate classroom behavior, they typically use strategies such as these:

- Describe target behaviors in objectively measurable terms.
- Identify one or more effective reinforcers.
- Develop a specific intervention or treatment plan that may involve reinforcement of desired behaviors, shaping, extinction, reinforcement of incompatible behaviors, punishment, or some combination of these strategies.
- Give explicit instruction related to desired behaviors.
- Measure the frequency of target behaviors both before the intervention (i.e., at baseline level) and during the intervention to monitor the intervention's effectiveness; modify the program if necessary.
- Take steps to promote generalization of new behaviors (e.g., through practice in various realistic situations).
- Gradually phase out the treatment (e.g., through intermittent reinforcement) after desired behaviors are occurring regularly.

The systematic use of behaviorist strategies such as these can lead to significant improvements in academic performance and classroom behavior. For example, when we systematically reinforce students for academic accomplishments, we're apt to see noticeable progress in such areas as reading, spelling, creative writing, and math. And when we regularly reinforce appropriate classroom behaviors—such as paying attention to lessons, cooperating with classmates, or responding constructively to someone else's aggressive actions—misbehaviors decrease (Elliott & Busse, 1991; Evertson & Weinstein, 2006; Greer et al., 2013; Piersel, 1987).

One likely reason that ABA often works so well is that it gives students clear and consistent messages about which behaviors are acceptable and which are not. Another likely reason is that through the gradual process of *shaping,* students begin to practice new behaviors only when they're truly ready to acquire those behaviors; thus, the probability of achieving success and getting reinforcement is quite high.

Functional Analysis

Traditional ABA focuses largely on changing response–reinforcement contingencies to bring about more appropriate behavior. Some behaviorists suggest that we also consider the purposes, or *functions*, that certain inappropriate behaviors may serve for people—an approach known as **functional analysis**. (You might also see the terms *functional assessment* and *functional behavioral assessment*.) Functional analysis involves collecting data regarding the specific conditions (i.e., antecedent stimuli) in which students tend to misbehave as well as the consequences (i.e., reinforcers, punishments, or both) that typically follow the misbehaviors. Thus, we would collect data related to the three parts of a stimulus–response–stimulus sequence, as depicted in the following diagram:

Antecedent
Behavior
Consequence

For example, we've speculated that in the opening case study, James misbehaves to get the attention he apparently cannot get in more productive ways and possibly also to escape certain classroom tasks. Functional analyses have shown that students with chronic classroom behavior problems often misbehave when (a) they're asked to do difficult or unpleasant tasks (this is the *antecedent*) and (b) their misbehavior either allows them to escape these tasks or gains them the attention of others (these are possible *consequences*) (e.g., Austin et al., 2015; Mueller et al., 2011).

When a student's problem behavior persists, try to identify functions that the behavior might serve for the student.

Positive Behavioral Interventions and Supports

An approach known as **positive behavioral interventions and supports (PBIS)** takes the process a step further: After identifying the purposes that inappropriate behaviors might serve, and the contexts in which they arise, a teacher—or, more often, a team of teachers and other professionals—develops and carries out a plan to encourage appropriate behaviors. In particular, PBIS involves strategies such as these:

- Teach behaviors that can serve the same purpose as (and can therefore replace) inappropriate behaviors.
- Modify the environment to minimize conditions that might trigger inappropriate behaviors.
- Establish a predictable daily routine as a way of minimizing anxiety and making the student feel more comfortable and secure.
- Give the student opportunities to make choices; in this way, the student can often gain desired outcomes without having to resort to inappropriate behavior.
- Make adaptations in the curriculum, instruction, or both to maximize the likelihood of academic success (e.g., build on the student's interests, present material at a slower pace, intersperse challenging tasks among easier and more enjoyable ones).
- Monitor the frequency of various behaviors to determine whether the intervention is working or, instead, requires modification. (Crone & Horner, 2003; Ruef et al., 1998; Scheuermann & Hall, 2016; Wheeler & Richey, 2014)

The following case study (summarized from DeVault et al., 1996) provides an example of how functional analysis and PBIS support might be used in combination:

> Nine-year-old Samantha had been identified as having a mild form of autism and moderate speech disabilities. She frequently ran out of her third-grade classroom, damaging school property and classmates' belongings in her flight. When an adult tried to intervene, she would fight back by biting, hitting, kicking, or pulling hair. On such occasions, school personnel often asked her parents to take her home.
>
> By systematically collecting data on Samantha's classroom performance, a team of teachers and specialists discovered that her misbehaviors typically occurred when she either was given or was expecting a difficult assignment. Departures from the regular schedule or the absence of favorite teachers further increased the frequency of misbehaviors.

The team hypothesized that Samantha's undesirable behaviors served two purposes: They (a) helped her escape unpleasant academic tasks and (b) enabled her to gain the attention of valued adults. The team suspected, too, that Samantha felt as if she had little or no control over classroom activities and that she yearned for more social interaction with her teachers and classmates.

Armed with this information, the team took several steps:

- Samantha was given a consistent and predictable daily schedule that included frequent breaks from potentially challenging academic tasks and numerous opportunities to interact with others.
- Samantha was given goal sheets from which she could choose the academic tasks she would work on, the length of time she would work on them, and the reinforcer she would receive for achieving each goal.
- Samantha was taught how to ask for help on challenging tasks.
- When Samantha felt she needed a break from academic work, she could ask to spend some time in the "relaxation room," a quiet and private space where she could sit in a beanbag chair and listen to soothing music.
- If Samantha tried to leave the classroom, an adult would place her immediately in the relaxation room, where she could calm down without a lot of adult attention.
- Samantha was given explicit instruction in how to interact appropriately with classmates. Initially, she earned points for appropriate social behaviors and could trade them for special treats (e.g., a family trip to Dairy Queen). Eventually, her new social skills led to natural consequences—friendly interactions with peers—that made extrinsic reinforcers unnecessary.

Samantha's problem behaviors didn't disappear overnight, but they showed a dramatic decline over the next few months. By the time Samantha was 12 years old and in sixth grade, her grades consistently earned her a place on the honor roll, and she had a group of friends with whom she participated in extracurricular activities. Her teachers described her as being sociable, inquisitive, and creative. Her principal called her a "model student" (DeVault et al., 1996).

Schoolwide Positive Behavioral Interventions and Supports

In recent years, some schools have successfully instituted **schoolwide positive behavioral interventions and supports (SWPBIS)** programs that encourage productive behaviors in *all* students (e.g., Freeman et al., 2016; Muscott et al., 2008). These programs typically include most or all of the following:

- Explicitly defining and teaching appropriate behaviors, including productive ways of getting desired outcomes
- Designing a curriculum and implementing instructional practices tailored to students' current needs and abilities
- Giving students opportunities to make choices
- Regularly reinforcing students for behaving appropriately, almost always with praise but often also with token reinforcers that can be traded for special prizes and privileges
- Providing considerable guidance and support (sometimes including individualized interventions) for students who need them
- Continually monitoring the program's effectiveness by examining the frequencies of office referrals, disciplinary actions, and other relevant data

You have previously encountered the SWPBIS approach in the discussion of special needs (Chapter 5), and you will see it again in a section on addressing aggression and violence at school (Chapter 12).

Such steps often lead to dramatic changes in students' behavior and are especially helpful in schools that have historically had many discipline problems. Furthermore, teachers become more optimistic that they can truly make a difference in improving students' classroom behavior and academic achievement (Bradshaw et al., 2015; Ihlo & Nantais, 2010; Osher et al., 2010; Warren et al., 2006).

Many SWPBIS programs take a multi-level approach, in which interventions and supports differ in kind and intensity depending on students' varying problem behaviors and needs. Such an approach is commonly called a **multi-tiered system of support (MTSS)**. Often, the program provides three levels of support:

- In *Tier 1*, basic instructional and behavior-support mechanisms are provided for all students. For instance, a school might have a concrete, systematic method of explicitly reinforcing all students for desired behaviors (e.g., good attendance records, mastery of specific skills).
- In *Tier 2*, students who appear to be at risk for either academic or social failure receive personally tailored interventions to assist them in their efforts to be more successful at school.
- In *Tier 3*, students who appear to be on the verge of dropping out or, alternatively, engaging in seriously troublesome behavior (e.g., significant violence) receive intensive one-on-one guidance and, if necessary, outside social services or psychiatric treatment.

MTSS allows for flexibility—students can move from one tier to another as their achievement levels and behaviors require more or less intervention and support.

Positive behavioral interventions and supports programs clearly have elements of behaviorist theory, including their focus on structuring an environment that reinforces desired behaviors and extinguishes undesirable ones. At the same time, they also incorporate contemporary theories of motivation, as reflected in their attempts to minimize anxiety, provide opportunities for choice making, and promote mastery of classroom tasks.

The importance of doing such things will become clearer in the discussion of motivation in Chapters 10 and 11.

Diversity in Student Behaviors and Reactions to Consequences

Learning Objective 6.7 Accommodate students' personal and cultural backgrounds and special needs in your applications of behaviorist principles.

When we take a behaviorist perspective, we realize that every student brings a unique history of experiences to the classroom, and such diversity is a key reason for the different behavior patterns we see. Some students may have associated particular stimuli with anxiety-arousing events (classical conditioning), and various students have undoubtedly been reinforced and punished—by parents, previous teachers, peers, and other community members—for different kinds of behaviors (instrumental conditioning). For example, some students may have been reinforced for completing tasks carefully and thoroughly, whereas others may have been reinforced for completing them quickly and with little regard for quality. Likewise, some students may have been reinforced for initiating interactions with age-mates, whereas others may have been punished (e.g., by peer ridicule or rejection) for similar outgoing behaviors. In some instances, diversity in students' behaviors is the result of the different behaviors that various cultural groups encourage (i.e., reinforce) and discourage (i.e., punish) in children and adolescents.

Differences also exist in the consequences students find reinforcing, to some degree as a result of the cultures in which they've grown up. For instance, although many students from mainstream Western culture are apt to appreciate praise for their personal accomplishments, many students from Asian cultures are unaccustomed to public praise, preferring instead to have simple compliments given in private along with feedback that helps them improve on their weaknesses. And many Native American students may feel uncomfortable when praised for their work as individuals yet feel quite proud when they receive praise for group success—a preference that's consistent with the cooperative spirit of most Native American groups (Fuller, 2001; Hattie & Gan, 2011; Jiang, 2010; Kitayama et al., 2007).

In some cultural groups, reprimands may be used to communicate concern and affection. For example, on one occasion a teacher in Haiti was reprimanding students for proceeding across a parking lot without her:

> ***Teacher:*** Did I tell you to go?
>
> ***Children:*** No.
>
> ***Teacher:*** Can you cross this parking lot by yourselves?
>
> ***Children:*** No.
>
> ***Teacher:*** That's right. There are cars here. They're dangerous. I don't want you to go alone. Why do I want you to wait for me, do you know?
>
> ***Claudette:*** Yes . . . because you like us. (Ballenger, 1992, p. 205)

Keep in mind that students from some cultures are unaccustomed to public praise for their individual accomplishments.

Accommodating Students with Special Needs

The structured, systematic use of behaviorist principles—such as those manifested in positive behavioral interventions and supports—can be especially effective with students who have cognitive, social, or behavioral disabilities. Table 6.5 offers specific recommendations for working with students who have various special needs. Behaviorist strategies are often important components of students' individual education programs (IEPs).

Chapter 5 identifies specific categories of special needs that fall within the five general categories listed in Table 6.5.

STUDENTS IN INCLUSIVE SETTINGS

Table 6.5 Encouraging Appropriate Behaviors in Students with Special Educational Needs

Category	Characteristics You Might Observe	Suggested Strategies
Students with specific cognitive or academic difficulties	• Inappropriate behaviors (for some students) • Less ability to delay gratification (for students with ADHD) • Avoidance behaviors when confronting challenging tasks	• Promote generalization of new responses (e.g., by pointing out similarities among different situations and by teaching skills in real-world contexts). • Have students work on assignments with classmates who are good role models and can encourage on-task behaviors.
Students with social or behavioral problems	• Inappropriate responses, especially in social situations; difficulty determining when and where particular responses are appropriate • A history of inappropriate behaviors being reinforced (e.g., intrinsically or by teacher attention) • Responsiveness to teacher praise if given in private (for students with emotional and behavioral disorders) • Little or no appreciation of praise from or social interactions with others (for some students with autism)	• Explicitly and concretely describe desired behaviors. • Reinforce desired behaviors using teacher attention, private praise, activity reinforcers, and group contingencies (for students with emotional and behavioral disorders). • Reinforce accomplishments immediately, using concrete reinforcers or activity reinforcers; combine them with praise so that praise eventually becomes reinforcing in and of itself (for students with severe forms of autism). • Shape desired behaviors over time; expect gradual improvement rather than immediate perfection. • Punish inappropriate behaviors (e.g., using time-out or response cost); implement positive behavioral interventions and supports for persistently challenging behaviors.
Students with general delays in cognitive and social functioning	• Appreciation of and responsiveness to extrinsic reinforcers • Difficulty delaying gratification; behavior more likely to improve when reinforcement is immediate rather than delayed • Inappropriate responses in social situations • Difficulty generalizing desired behaviors from one situation to another	• Explicitly teach and cue appropriate behaviors, but with the goal of having students eventually engage in such behaviors without prompts. • Shape complex behaviors slowly over time; expect gradual improvement rather than immediate perfection. • Reprimand minor misbehaviors; use time-out or response cost for more serious and chronic misbehaviors. • Promote generalization of new responses (e.g., by teaching skills in real-world contexts and by reinforcing generalization).
Students with physical or sensory challenges	• Loss of some previously learned behaviors if students have had traumatic brain injury	• Shape desired behaviors slowly over time; expect gradual improvement rather than immediate perfection.
Students with advanced cognitive development	• Unusual and sometimes creative responses to classroom tasks	• Encourage and reinforce creative responses.

SOURCES: Barbetta, 1990; Beirne-Smith et al., 2006; Cooper et al., 2007; Cuskelly et al., 2003; Ellis & Friend, 1991; Goldstein & Rider, 2006; Hausman et al., 2014; Heward, 2009; Hobson, 2004; Leaf et al., 2016; Mercer & Pullen, 2005; Mueller et al., 2011; Neef et al., 2005; Pfiffner et al., 2006; Piirto, 1999; Turnbull et al., 2016.

Chapter 6 What Have You Learned?

As a way of recapping our discussion of behaviorist principles, we now return to the chapter's learning objectives.

6.1 **Describe basic assumptions of theories of learning and use these assumptions to help you better understand how people of all ages typically think and learn.** Learning is a long-term change in mental representations or associations as a result of experience. Theoretical perspectives differ in the emphasis they place on observable events, individuals' thoughts, and cultural influences.

6.2 **Describe five basic assumptions underlying behaviorist views of learning and apply these assumptions to classroom practices.** Behaviorists focus primarily on two things they can directly observe and measure: (a) stimuli in a learner's present and recent past environments and (b) a learner's responses to those stimuli. Many behaviorists view learning as a change in behavior (rather than as a mental change) and explain it in terms of specific stimulus–response associations. Key to forming such associations is close proximity in time (contiguity) between the stimuli and responses involved. Many behaviorist principles of learning apply equally to human beings and other animal species.

6.3 **Explain how people can acquire involuntary responses through classical conditioning and how you might help students overcome classically conditioned emotional responses that interfere with their classroom performance.** Classical conditioning occurs when (a) one stimulus (the unconditioned stimulus) already elicits a particular response (the unconditioned response) and (b) that stimulus is presented in conjunction with another stimulus, usually on several occasions. Under these circumstances, the second stimulus (now a conditioned one) begins to elicit a (conditioned) response as well. Classical conditioning is one possible explanation for why students may have unproductive emotional reactions in certain learning environments—say, in math class or on the athletic field. As teachers, we should strive to create instructional environments that condition pleasure and relaxation responses to new tasks and activities, not an environment that elicits fear and anxiety.

6.4 **Describe the effects that various kinds of consequences can have on behavior.** By definition, a *reinforcing* stimulus increases the behavior it follows, whereas a *punishing* stimulus decreases the behavior. Taken together, these two effects are known as *instrumental conditioning,* although you may also see the term *operant conditioning* used in reference to the effects of a reinforcer.

Positive reinforcement is at work when a response increases after previously being followed by the presentation of a particular stimulus or event (e.g., a compliment or opportunity to engage in a favorite activity). Negative reinforcement is at work when a response increases after previously being followed by the *removal* of an *unpleasant* stimulus (e.g., a frustrating task or feeling of anxiety).

Negative reinforcement—which *increases* the behavior—shouldn't be confused with punishment, which can involve either the presentation of a stimulus (presumably one that a learner finds undesirable) or the removal of a stimulus (presumably one that a learner does not want to get rid of). Some forms of punishment (e.g., mild reprimands, time-outs) can be quite effective when used judiciously, whereas others (e.g., public humiliation, out-of-school suspension) are usually counterproductive.

6.5 **Apply behaviorist principles to encourage appropriate and productive behaviors throughout the school day.** We can increase the frequency of desired behaviors either by reinforcing those behaviors whenever they occur or by gradually shaping them over time. Our use of reinforcement is more likely to be effective when we make response–consequence contingencies explicit and when we individualize reinforcers to match students' preferences. By itself, however, reinforcement can bring about behavior change only when students have the physical and cognitive *ability* to behave appropriately.

Students' behaviors are influenced not only by the behaviors' consequences but also by antecedent events. For example, once students have learned a particular response to a particular stimulus, they may make the same response to similar stimuli. Seemingly similar situations occasionally call for very different behaviors, however, and so we must help students discriminate between occasions when certain responses are and are not appropriate. It's important, too, to create environments that readily evoke desired student behaviors and to introduce challenging tasks only after students have become comfortable performing similar but slightly easier ones.

Behaviorist principles also offer several strategies for reducing nonproductive or counterproductive behaviors. As teachers, we might remove the consequences that reinforce unwanted behaviors (possibly resulting in extinction), gently remind (cue) students that some of their current behaviors are unacceptable, or reinforce responses that are incompatible with the ones we want to eliminate. In some cases, we may need to resort to punishment, especially if students' behaviors significantly interfere with learning or jeopardize one or more students' welfare. We can maximize the effectiveness of punishment by adhering to certain guidelines in its use. For example, we should tell students ahead of time which behaviors are unacceptable and what the particular consequences will be if they engage in them, and we should administer punishment within the context of a warm, supportive relationship—one that communicates a genuine concern for students' well-being.

6.6 Building on behaviorist ideas, describe four systematic approaches to addressing persistent behavior problems. Applied behavior analysis (ABA), functional analysis, and positive behavioral interventions and supports (PBIS) are three overlapping approaches through which we can apply behaviorist principles to one or more individual students in a systematic fashion. Such techniques are often effective in promoting achievement and appropriate classroom behavior, even in cases where other approaches haven't worked. PBIS can also be effectively applied on a schoolwide basis—making it *schoolwide* positive behavioral interventions and supports (SWPBIS)—to reduce discipline problems and enhance student achievement throughout the school building.

6.7 Accommodate students' personal and cultural backgrounds and special needs in your applications of behaviorist principles. Students in any single classroom have inevitably had different histories of reinforcement and different prior experiences with the stimuli they encounter at school; hence, they will have varying reactions to any particular task or situation. Students' cultural backgrounds may also have contributed to their diversity; for example, some students may appreciate praise only when it's given in private, and others may prefer reinforcement for group achievement rather than individual accomplishments.

Students with cognitive, social, or behavioral disabilities can especially benefit from the structured, consistent learning environments that behaviorists advocate. For example, a functional analysis can help us understand why a certain student is frequently aggressive or noncompliant and then enable us to plan an intervention that promotes more productive classroom behaviors. And consistent, explicit, and immediate use of reinforcement to shape increasingly complex behaviors can help students with cognitive disabilities acquire many new skills.

Practice for Your Licensure Exam

Hostile Helen

Mr. Washington has a close-knit group of friends in one of his high school career technical education classes. He is concerned about a particular student in this friendship group: a girl named Helen. Helen uses obscene language in class. She's also rude and disrespectful to Mr. Washington, and she taunts and insults classmates outside her own circle of friends. In addition, Helen is physically aggressive toward school property; for example, she sometimes defaces furniture, kicks equipment, and punches walls.

At first, Mr. Washington tries to ignore Helen's hostile and aggressive behaviors, but this strategy doesn't lead to any improvement in her behavior. He then tries praising Helen on those rare occasions when she does behave appropriately, but this strategy doesn't seem to work either.

1. *Multiple-choice question:*

Mr. Washington initially tries to ignore Helen's inappropriate behavior. This approach best reflects which one of the following concepts from behaviorism?

a. Extinction
b. Response cost
c. Functional analysis
d. Negative reinforcement

2. **Multiple-choice question:**

   Later, Mr. Washington tries praising Helen for appropriate behaviors. This approach best reflects which one of the following behaviorist concepts?

   a. Setting event
   b. Discrimination
   c. Reinforcement of incompatible behaviors
   d. Positive behavioral interventions and supports

3. **Constructed-response question:**

   Many research studies indicate that behaviorist principles *can* be effective in bringing about significant improvements in students' classroom behavior, yet neither of Mr. Washington's strategies has an effect on Helen's classroom behavior.

   A. Suggest at least three different reasons why Mr. Washington's strategies might not be having much effect.
   B. Describe how *you* might use behaviorist learning principles to bring about a behavior change in Helen. Be specific about what you would do.

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 7

Learning, Cognition, and Memory

Jose Luis Pelaez Inc/DigitalVision/Getty Images

Learning Objectives

7.1 Describe five basic assumptions underlying cognitive theories of learning and use these assumptions to help you better understand how people of all ages typically think and learn.

7.2 Describe key components that many psychologists believe may characterize the human memory system.

7.3 Apply your knowledge of long-term memory storage to identify effective strategies for enhancing students' learning.

7.4 Explain how students' self-constructed beliefs can sometimes interfere with effective learning, and identify several ways of helping students productively revise such beliefs.

7.5 Describe several factors that influence students' ability to recall what they have previously learned; also describe several reasons why students may either forget or incorrectly remember what they have learned.

7.6 Give examples of the diversity in cognitive processes you are likely to see in students, in some cases as a result of students' cultural backgrounds or special educational needs.

CASE STUDY

Tests on Friday

Elijah and Mia are seventh graders who attend Abbott Middle School. They have known each other since kindergarten and have always been friendly. In seventh grade, they have the exact same schedule at school, and are together in all their classes. This week, they have several tests and quizzes all on the same day: They have a social studies test on the capitals of all of the nations in Europe, a language arts test on 30 new vocabulary words, and a science test on the digestive system. They have the following conversation on Wednesday afternoon:

Elijah: I'm freaked out about these tests. I can't remember all of that stuff. I'm going to confuse everything. There is so much to remember. I'll probably end up labeling the large intestine as "Paris" and the liver as "Amsterdam."

Mia: What are you so worried about? Memorization just takes time. I'm not worried, I am studying each night this week, and re-testing myself each night on what I studied the night before. That's what I always do. This isn't a big deal Elijah.

Elijah: Easy for you to say. You're good at memorizing things. I can't remember anything.

Mia: Yes you can. Since we're talking about this, I was wondering why Mrs. Young is making us memorize the capitals of European countries anyway. Anytime we need that information we can look it up on the internet and have the answer in half a second. Do we really need to memorize that stuff?

Elijah: Good question. I better go study.

- Why is Elijah so worried about these tests, while Mia isn't concerned? Would you be able to remember all of this information for tests being given on the same day? Why is Mrs. Young asking students to memorize information that is readily available to them on the internet? What do your answers to these questions suggest about the nature of human learning?

In the last chapter, we looked at external influences on learning (e.g., reinforcements and punishments). In this chapter, we'll look primarily at what goes on *inside* the learner.

Basic Assumptions of Cognitive Psychology

Learning Objective 7.1 **Describe five basic assumptions underlying cognitive theories of learning and use these assumptions to help you better understand how people of all ages typically think and learn.**

At the core of cognitive psychology are several basic assumptions about how people learn. These are summarized in Table 7.1

- *Cognitive processes influence what is learned.* The specific things people mentally do as they try to interpret and remember what they see, hear, and study—that is, their **cognitive processes**—have a profound effect on what they specifically learn and remember. For example, in the opening case study, if the classroom tests only ask students to memorize vocabulary, students may be less able to recall and use that information later.
- *People's cognitive processes can sometimes be inferred from their behaviors.* Historically, some psychologists—especially behaviorists—have argued that because we can't directly observe people's thinking, we can't possibly study it objectively and scientifically. Cognitive psychologists disagree, suggesting that by observing people's responses to various events, it's possible to draw reasonable *inferences*—to make educated guesses—about the cognitive processes that probably underlie the

Experiencing Firsthand

Remembering 12 Words

Read the 12 words below *one time only.* Then cover up the page and either say or write down the words in the order they come to mind.

shirt
carrot
pants
chair
table
bed
potatoes
shoe
hat
squash
stool
bean

responses. As an example of how we might learn about people's cognitive processes by observing their behaviors, try the exercise given above.

Did you recall the words in the order in which you had read them? Probably not. If you're like most people, you recalled the words largely by category—perhaps clothing first, then vegetables, then furniture. From the order in which you recalled the words (i.e., from your *behavior*), we can draw an inference about an internal cognitive process that occurred as you learned the words: You mentally *organized* them into categories.

- *People are selective about what they mentally process and learn.* We are constantly bombarded with information. Consider the many stimuli you're encountering at this very moment—for instance, the many letters on this page, the many others objects you can see while you're reading, the many sounds reaching your ears, and the clothes rubbing against your skin. You've probably been ignoring most of these stimuli until just now, when you were reminded about them.

  It's useful to distinguish between *sensation*—one's ability to detect stimuli in the environment—and *perception*—one's interpretation of stimuli. For reasons you'll discover a bit later, it's virtually impossible to perceive (interpret) everything that the body senses. Because learners can handle only so much information at a given time, they must choose a few things to focus on and ignore the rest.

  As an analogy, consider the many, many items you receive in your mail and email boxes each year. Do you open, examine, and respond to every piece of mail? Probably not. Chances are that you process a few key items, inspect other items long enough to know that you don't need them, and discard others without even opening them. In much the same way, students encounter a great deal of new information every day—information delivered by way of teacher instruction, textbooks, bulletin boards, classmates' behaviors, smartphones, and so on. They must inevitably make choices about which pieces of information are important to attend to. They select a few stimuli to examine and respond to in depth, give other stimuli only a cursory glance, and ignore other stimuli altogether.
- *Learners actively construct interpretations of phenomena and events in their environment.* People often create their own unique understandings about a topic—understandings that may or may not be accurate. This process of **construction** lies at the core of many cognitive theories of learning: Learners try to make some sort of reasonable *sense* of the many separate pieces of information they receive about various aspects of their world. Learning theories that focus primarily on the nature of this constructive process are collectively known as **constructivism**. A subcategory of constructivism is **individual constructivism**, which focuses on how learners idiosyncratically construct knowledge *on their own*, with little or no assistance from other people.

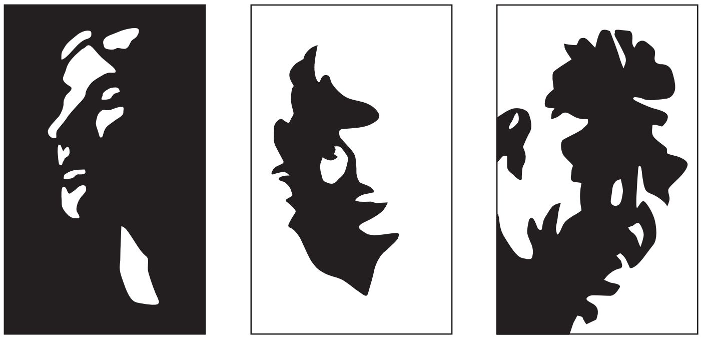
In contrast to individual constructivism, a perspective known as *social constructivism* focuses on how people often work collaboratively to make sense of their joint observations and experiences (see Chapter 9).

To experience the process of construction firsthand, try the following exercise.

Experiencing Firsthand

Three Faces

Look at the three black-and-white figures shown here. What do you see in each one? Most people perceive the figure on the left to be that of a woman, even though many of her features are missing. Is enough information available in the other two figures for you to construct two more faces? Construction of a face from the figure on the right may take a while, but it can be done.



SOURCE: Figures from "Age in the Development of Closure Ability in Children" by C. M. Mooney, 1957, *Canadian Journal of Psychology, 11*, p. 220. Copyright © 1957 by Canadian Psychological Association. Reprinted with permission.

Objectively speaking, the three configurations of black splotches leave a lot to the imagination. The woman in the middle is missing half of her face, and the man on the right is missing the top of his head. Yet knowing what human faces typically look like may have been enough to enable you to mentally add the missing features and perceive complete pictures. Curiously, once you've constructed faces from the figures, they then seem obvious. If you were to close this book now and not pick it up again for a week or more, you would probably see the faces almost immediately, even if you had had considerable difficulty perceiving them originally.

As teachers, we must remember that students won't necessarily learn information exactly as we present it to them. In fact, they'll each interpret what they are learning in their own, idiosyncratic ways. And occasionally they may construct *mis*information.

- *Maturational changes in the brain enable increasingly sophisticated cognitive processes with age.* With the advent of new technologies for studying the brain, psychologists have teamed with experts in neurology to learn more about how the brain functions and how it changes with age and experience. This body of research, known by such names as **neuropsychology** and **cognitive neuroscience**, has enabled psychologists to test various hypotheses about the precise nature of human learning and thinking. Furthermore, it has revealed that the human brain changes in significant ways over the course of childhood and adolescence. Such changes are almost certainly one key reason why children become capable of increasingly effective cognitive processes, such as having longer attention spans and experiencing enhanced ability to organize and integrate information (Atkins et al., 2012; Nelson et al., 2006; Plebanek & Sloutsky, 2017). But rather than propose distinct stages of cognitive development (as early developmental psychologist Jean Piaget did), most cognitive psychologists believe that children's cognitive development can best be characterized as gradual *trends.* As we proceed through the chapter, we'll identify a number of developmental trends in children's cognitive processes.

Chapter 2 describes several ways in which the human brain matures over the course of childhood and adolescence; it also describes Jean Piaget's theory of cognitive development.

PRINCIPLES/ASSUMPTIONS

Table 7.1 Basic Assumptions of Cognitive Psychology and Their Educational Implications

Assumption	Educational Implication	Example
Influence of cognitive processes	Encourage students to think about what you are teaching in ways that will help them remember it.	When introducing the concept *mammal,* ask students to identify many examples of mammals.
Behavior as a reflection of cognitive processes	Ask students to explain their reasoning, and look closely at what they do and say to make educated guesses about their thought processes.	When a student says that $16 + 19 = 25$ and that $27 + 27 = 44$, hypothesize that the student is forgetting to regroup in both equations—that is, when she adds the numbers in the ones columns, getting 15 in the first equation and 14 in the second, she forgets to carry the 1 to the tens column—and provide additional instruction about the regrouping process.
Selectivity about what is learned	Help students identify the most important things for them to learn. Also, help them understand *why* these things are important.	Give students questions they should try to answer as they read. Include questions that ask them to apply what they read to their own lives.
Construction of meanings and understandings	Provide experiences that will help students make sense of the topics they're studying, and regularly monitor students' understandings.	When studying Nathaniel Hawthorne's *The Scarlet Letter*, have students convene in small groups to discuss possible reasons that the Reverend Dimmesdale refuses to acknowledge that he is the father of Hester Prynne's baby.
Increasing capacity for sophisticated cognitive processes with age	Take into account strengths and limitations of students' cognitive processing capabilities at different age levels.	When teaching kindergartners basic counting skills, accommodate their short attention spans by keeping verbal explanations brief and conducting a variety of active, hands-on counting activities.

A Model of Human Memory

Learning Objective 7.2 Describe key components that many psychologists believe may characterize the human memory system.

Cognitive psychologists have offered many explanations regarding how people mentally process and remember new information and events—explanations that fall into the general category of **information-processing theory**. Some early explanations portrayed human thinking and learning as being similar to the ways computers operate. It has since become clear, however, that the computer analogy is too simple: People often think about and interpret information in ways that are hard to explain in the relatively simplistic, one-thing-always-leads-to-another ways that are typical for computers (e.g., Hacker et al., 2009a; Marcus, 2008).

Central to information processing theory is the concept of **memory**. In some instances, we'll use this term to refer to learners' ability to mentally save previously learned knowledge or skills over time; in other instances, we'll use it when talking about a particular location where learners "put" what they learn—perhaps in *working memory* or *long-term memory*.

The process of putting what is being learned into memory is called **storage**. For example, each time you go to class, you undoubtedly *store* some of the ideas presented in a lecture or class discussion. You may store other information from class as well—perhaps the name of the person sitting next to you (George) or the pattern of the instructor's shirt (a ghastly combination of orange and purple splotches). Yet learners rarely store information exactly as they receive it. Instead, they engage in **encoding**, modifying the information in some way. For instance, when listening to a history lecture, you might imagine what certain historical figures may have looked like—thus encoding some verbal input as visual images. And when you see your instructor's orange and purple shirt, you might think, "This person desperately needs a wardrobe makeover"—thus assigning a specific *meaning* and *interpretation* to what you've seen.

At some point after storing a piece of information, you may discover that you need to use it. The process of recalling previously stored information—that is, finding it in memory—is called **retrieval**. The following exercise illustrates this process.

Experiencing Firsthand

Retrieval Practice

See how quickly you can answer each of the following questions:

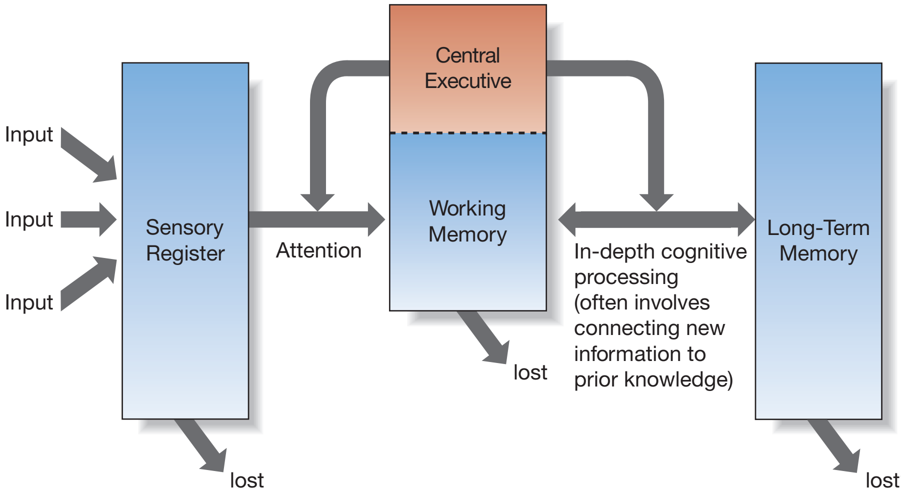
1. What is your name?
2. What is the capital of Australia?
3. In what year did Christopher Columbus first sail across the Atlantic Ocean to reach the New World?
4. When talking about appetizers at a party, we sometimes use a French term instead of the word *appetizer.* What is that French term, and how is it spelled?

As you probably noticed when you tried to answer these questions, retrieving some kinds of information from memory—your name, for instance—is quick and easy. Other things—perhaps the capital of Australia (Canberra) and the year of Columbus's first voyage across the Atlantic (1492)—can be retrieved only after a little bit of thought and effort. Still other pieces of information, even though you may have stored them in memory at one time, may be almost impossible to retrieve. Perhaps the correct spelling of *hors d'oeuvre* falls into this category.

Despite their common use of such terms as *storage, encoding,* and *retrieval,* information-processing theorists don't all agree about the precise nature of human memory. However, many suggest that memory has three key components: a sensory register, a working memory, and a long-term memory. A three-component model of human memory, based loosely on one proposed by Atkinson and Shiffrin in 1968 with modifications to reflect more recent research findings, is presented in Figure 7.1. The model oversimplifies the nature of memory to some degree (more about this point later), but it provides a good way to organize much of what we know about how memory works.

Please note that in referring to three components of memory, we're *not* necessarily referring to three separate parts of the brain. The model of memory we describe here has been derived largely from studies of human behavior, rather than from studies of the brain.

Figure 7.1 A model of the human memory system.



The Nature of the Sensory Register

If you have ever played with a lighted sparkler at night, you've seen a trail of light that follows the sparkler as you wave it about. If you have ever daydreamed in class, you may have noticed that when you tune back in to a lecture, you can still hear the three or four words that were spoken just *before* you started paying attention to your instructor again. The sparkler's trail and the words that linger aren't actually out there in the environment. Instead, they're recorded in your sensory register.

The **sensory register** is the component of memory that holds the information you receive—the *input*—in more or less its original, *un*encoded form. We can hold information that we perceive through all of our senses, and that information is briefly stored the way we perceive it. Thus, visual input is stored in a visual form, and auditory input is stored in an auditory form (e.g., Coltheart et al., 1974; Cowan, 1995). And we can perceive information via multiple senses simultaneously. For example, if you are watching a scary movie, you might be aware of a scary image, a fearful scream, and the taste of the popcorn that you are eating. In addition to being able to perceive input from multiple senses, the sensory register has a *large capacity:* It can hold a great deal of information at any one time.

That's the good news. The bad news is that information stored in the sensory register doesn't last very long (e.g., Cowan, 1995; Dahan, 2010; Wingfield & Byrnes, 1981). Visual information (i.e., what you see) probably lasts for less than a second. Auditory information (i.e., what you hear) probably lasts slightly longer, perhaps for two or three seconds. As we'll see later, this has implications for how you teach and how your students learn. To keep information for any time at all, then, learners need to move it to *working memory.* Whatever information isn't moved is probably lost or forgotten.

Moving Information to Working Memory: The Role of Attention

Sensory information, such as the light cast by a sparkler, doesn't last very long no matter what we do. But we can preserve a memory of it by encoding it in some minimal way. In the model of memory presented in Figure 7.1, the first step in this process is **attention**: *Whatever someone mentally pays attention to moves into working memory.* If information in the sensory register doesn't get a person's attention, it presumably disappears from the memory system.

Paying attention involves directing not only the appropriate sensory receptors (in the eyes, ears, etc.) but also the *mind* toward whatever needs to be learned and remembered. Imagine yourself reading a textbook for one of your classes. Your eyes are moving down each page, but you're thinking about something altogether different—a recent argument with a friend or your growling stomach. What will you remember from the textbook? Absolutely nothing. Even though your eyes have been focused on the words in the book, you haven't been *mentally* attending to the words.

Young children's attention often moves quickly from one thing to another and is easily drawn to objects and events unrelated to the task at hand. For example, although decorating walls with colorful pictures and other images can make a kindergarten classroom more appealing for children, a *lot* of colorful décor is likely to distract many kindergartners from their lessons (Fisher et al., 2014). As children grow older, they become better able to focus their attention on a particular task and keep it there, and they're less distracted by irrelevant thoughts and events. Yet even adult learners can't keep their minds entirely on a single task for a prolonged time (Carlson & Moses, 2001; Immordino-Yang et al., 2012; Plebanek & Sloutsky, 2017).

Even when learners *are* paying attention, they can attend to only a very small amount of information at any one time. In other words, attention has a *limited capacity* (Cherry, 1953; Cowan, 2007). For example, if you're sitting in front of your television set with your textbook open in your lap, you can attend to a *Big Bang Theory* rerun playing on TV *or* to your book, but not to both simultaneously. And if, in class, you're preoccupied with your instructor's desperate need for a fashion makeover, you're unlikely to be paying attention to the lecture itself.

Exactly *how* limited is human attention? People can often perform two or three well-learned, automatic tasks at once. For example, you can walk and chew gum simultaneously, and you can probably drive a car and drink a cup of coffee at the same time. But when a stimulus or event is detailed and complex (as both textbooks and television shows are) or when a task requires considerable thought (as understanding a lecture and driving a car on an icy mountain road would), then people can usually attend to only *one* thing at a time. Despite our best efforts, we humans are *not* very good at multitasking (Lien et al., 2006; Ophir et al., 2009).

As teachers, we must remember that attention isn't just an observable behavior; it's also a mental process. The Into the Classroom feature "Getting and Keeping Students' Attention" presents several effective strategies for keeping students' minds on classroom topics.

The Nature of Working Memory

Working memory is the component of human memory where we hold attended-to information for a short time while we try to make sense of it. Working memory is also where much of our active cognitive processing occurs. Working memory is extremely important in the learning of math, reading, and science (Byrnes et al., 2018; Morgan et al., 2019; Morra et al., 2019; Peng et al., 2019). For instance, it's where we analyze a textbook passage or solve a math problem. Basically, this is the component that does most of the mental work of the memory system—hence its name, *working* memory.

Rather than being a single entity, working memory probably has several components for holding and working with different kinds of information—for example, visual information, auditory information, and the underlying meanings of events—as well as a component that integrates multiple kinds of information. As shown in Figure 7.1, working memory may also include a **central executive** that focuses attention, oversees the flow of information throughout the memory system, selects and controls complex voluntary behaviors, and inhibits counterproductive thoughts and actions (Baddeley, 2001; Krakowski et al., 2016; Logie, 2011; Swanson, 2017). Such processes—collectively known as **executive functions**—improve over the course of childhood and adolescence (partly as a result of brain maturation) and significantly enhance students' academic performance (Atkins et al., 2012; Best & Miller, 2010; Masten et al., 2012) and classroom behavior (Wang & Liu, 2021).

Information stored in working memory doesn't last very long—perhaps 5 to 20 seconds at most—unless the learner consciously does something with it (e.g., Baddeley, 2001; Camos, 2015; Zhang & Luck, 2009). Accordingly, this component is sometimes called *short-term memory*. For example, imagine that you are shopping for a new laptop. You have a question about a specific laptop, so you look at the model number (e.g., Model # 4297638) and you then walk right over to a salesperson to ask some questions. Because you've paid attention to the model number, it's presumably in your working memory. But before you reach the salesperson, someone else gets there first and you have to wait a few minutes. What do you do to remember the number until you have access to the salesperson? If you're like most people, you probably repeat it to yourself over and over again. This process, known as **maintenance rehearsal**, keeps information in working memory for as long as you're willing to continue talking to yourself. But once you stop, the number will disappear fairly quickly.

When learners consciously and intentionally control their own thought processes, they are engaging in *metacognition*, discussed in depth in Chapter 8.

Recent research suggests that working memory capacity is related to higher achievement in math and reading, and that achievement in those domains further contributes to improvements in children's working memory (Miller-Cotto & Byrnes, 2020). Some research also suggests that anxiety may interfere with working memory when

Into The Classroom

Getting and Keeping Students' Attention

- **Create stimulating lessons in which students *want* to pay attention.**

  In their reading groups, students in a second-grade class are reading short stories with elements of fantasy (e.g., fairies, trolls, magic). After a group finishes a story, it writes a play based on the story, creates simple props for the play (e.g., crowns, magic wands), and eventually performs the play for the rest of the class.

- **Get students physically involved with the subject matter.**

  A middle school history teacher plans a day when all of his classes "go back in time" to Ancient Greece. In preparation for the event, the students spend several weeks learning about the Greek gods and goddesses, researching typical dress and meals of the era, and learning about the origins of the Olympics. When the big day comes, the students come to school in costumes, eat Greek food for lunch, and have their own mini-Olympics.

- **Incorporate a variety of instructional methods into lessons.**

  After explaining how to calculate the areas of squares and rectangles, a fourth-grade teacher has her students practice calculating areas in a series of increasingly challenging word problems. She then breaks the class into three- to four-member groups, gives each group a tape measure and calculator, and asks the students to calculate the area of their irregularly shaped classroom floor. To complete the task, the students must divide the room into several smaller rectangles, compute the area of each rectangle separately, and add the subareas together.

- **Get students emotionally engaged with the subject matter.**

  In describing the hardships that people endure in war-torn countries, a high school social studies teacher presents video images of neighborhoods that have been demolished by enemy bombs. The teacher chooses images that can help students empathize with the people's plight but aren't likely to evoke overwhelming distress.

- **Regularly ask questions.**

  During lessons about such concepts as *velocity, acceleration, force,* and *inertia,* a high school physics teacher occasionally presents a multiple-choice question involving a real-world scenario (e.g., "Why does a baseball continue to move forward after it has left the pitcher's hand?"). To ensure that all students respond to such questions, the teacher gives them each a hand-held electronic clicker with which they can individually communicate their answers.

- **Provide frequent breaks from sedentary activities, especially when working with students in the elementary grades.**

  To provide practice with the alphabet, a kindergarten teacher occasionally has students make letters with their bodies. For example, one girl stands with her arms extended up and out to make a Y, and two boys bend over and join hands to form an M.

- **In middle school and high school grades, encourage students to take notes.**

  In a middle school science class, different cooperative groups have been specializing in and researching various endangered species. As each group gives an oral report about its species to the rest of the class, the teacher asks students in the audience to jot down questions about things they would like to know about the animal. Upon the completion of their prepared report, members of the presenting group respond to their classmates' questions.

- **Restrict students' access to electronic devices when classroom lessons and tasks don't require their use.**

  Students in a high school language arts class all have personal laptop computers on which they do much of their writing. Knowing that they might easily be tempted to venture over to distracting websites, their teacher has them turn on the laptops only during writing assignments, and she regularly walks among the students both to answer questions and to monitor computer screens for possible off-task activities.

SOURCES: Some strategies based on Blanchette & Richards, 2004; Di Vesta & Gray, 1972; Glass & Sinha, 2013; Harmon-Jones et al., 2013; Kiewra, 1989; Ku et al., 2008; Pellegrini & Bjorklund, 1997; Posner & Rothbart, 2007; Ravizza et al., 2017; Szpunar, 2017.

children are solving problems, and consequently negatively affect their achievement (Szczygieł, 2021). For example, a child who is very anxious when solving math problems may have diminished access to working memory, which in turn may make it more difficult for them to solve the math problems assigned. The amount of information children can hold in working memory increases a bit with age, probably as a result of both brain maturation and the acquisition of more effective cognitive processes (Barrouillet & Camos, 2012; Kail, 2007; Sørensen & Kyllingsbæk, 2012). And children can prioritize specific information in working memory when they are provided with appropriate incentives (Atkinson et al., 2019). Yet even adults have only so much "room" to simultaneously hold and think about information. To see what we mean, put your working memory to work for a moment in the following exercise.

Experiencing Firsthand

Division Problem

Try computing the answer to this division problem in your head:

$$59\overline{)49{,}383}$$

Did you find yourself having trouble remembering some parts of the problem while you were dealing with other parts? Did you ever arrive at the correct answer of 837? Most people can't solve a division problem with this many digits unless they write it down. Working memory just doesn't have enough space both to hold all that information and to perform mathematical calculations with it. Like attention, working memory has a *limited capacity*—perhaps just enough for a telephone number or very short grocery list (Cowan, 2010; Logie, 2011; G. A. Miller, 1956).

Virtually any learning activity imposes a **cognitive load**—a certain amount of information that learners must simultaneously think about, along with certain *ways* that they must think about it, in order to make sense of and remember what they're studying (Mayer, 2011a; Plass et al., 2010; Sweller, 1988, 2008). As teachers, when we design lessons, we must consider just how much of a load students' working memories can reasonably handle at any given time. For example, we should minimize information that's irrelevant to the topic at hand. We should pace the presentation of important information slowly enough that students have time to effectively process what they're seeing and hearing. And we might repeat the same idea several times (perhaps rewording it each time), stop to write important points on the board, and provide several examples and illustrations.

Keep the limited capacity of working memory in mind when designing and conducting lessons.

We authors sometimes hear students talking about putting class material in "short-term memory" so that they can do well on an upcoming exam. Such a statement reflects the common misconception that this component of memory lasts for several hours, days, or weeks. Now you know otherwise. Working memory is obviously *not* the place to leave information that you need for an exam later in the week or even information you need for a class later in the day. For such information, storage in long-term memory—the final component of the memory system—is in order.

Moving Information to Long-Term Memory: Connecting New Information with Prior Knowledge

In the model of memory depicted in Figure 7.1, the arrow between working memory and long-term memory points in both directions. In most cases, effectively storing new information in long-term memory involves connecting it to relevant information that's *already* in long-term memory—a process that requires bringing the "old" information back into working memory. The exercise on the next page can give you an idea of how this might happen.

No doubt the second letter string was easier to learn because you could relate it to something you already knew: the words *familiar words.* How easily were you able to learn and remember the picture? Do you think you could draw it from memory a week from now? Do you think you could remember it more easily if it had the title "Bird's Eye View of a Cowboy Riding a Bicycle"? The answer to the last question is almost certainly

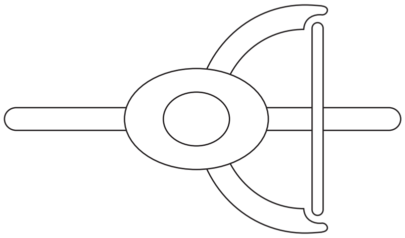
Experiencing Firsthand

Letters and a Picture

1. Study the two strings of letters below until you can remember each string perfectly:

   AIIRODFMLAWRS FAMILIARWORDS

2. Study the picture shown here until you can reproduce it accurately from memory.



yes, because the title would help you relate the picture to familiar shapes, such as those of a bicycle and a cowboy hat (e.g., see Bower et al., 1975). As you will see throughout this chapter, one of the most effective strategies that you, as a teacher, can use to help your students remember new content is to help them to relate what they are learning to information that they already have learned. When learners can relate new content to their *prior knowledge*, they are more likely to remember the new content in the future.

The Nature of Long-Term Memory

Long-term memory is where learners store their general knowledge and beliefs about the world, the things they've learned from formal instruction (e.g., the capital of Australia, the correct spelling of *hors d'oeuvre*), and their recollections of events in their personal lives. It's also where learners store their knowledge about how to perform various actions, such as how to dribble a basketball, use a smartphone, and do long division.

Much of the information stored in long-term memory is interconnected. To see what we mean, try the next exercise.

Experiencing Firsthand

Starting with a Horse

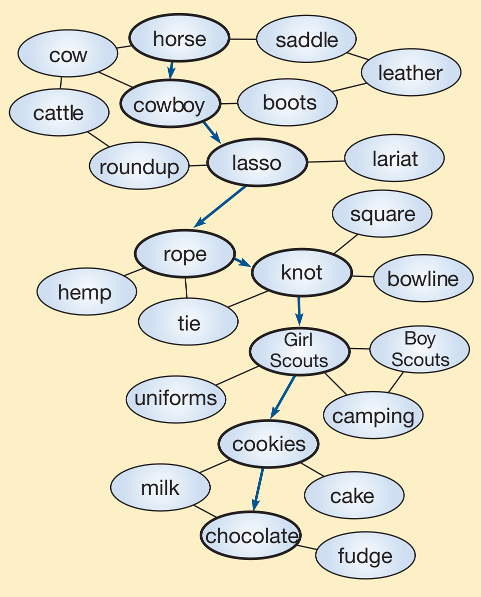
What's the first word that comes to mind when you see the word *horse?* And what word does that second word remind you of? And what does the third word remind you of? Beginning with the word *horse*, follow your train of thought, letting each word remind you of a new word or short phrase, for a sequence of at least eight words or phrases. Write down the sequence of things that come to mind.

You probably found yourself easily following a train of thought from the word *horse,* perhaps something like the route that one of we authors followed:

horse → cowboy → lasso → rope → knot → Girl Scouts → cookies → chocolate

The last word in your sequence might be one with little or no obvious relationship to horses. Yet you can probably see a logical connection between each pair of items in the sequence. Related pieces of information tend to be associated with one another in long-term memory, perhaps in a network similar to the one depicted in Figure 7.2.

Figure 7.2 A possible train of thought from *horse* to *chocolate*.



Information stored in long-term memory lasts much, much longer than information stored in working memory—perhaps it lasts a day, a week, a month, a year, or a lifetime, depending on a variety of factors that we'll examine in upcoming sections of the chapter. In addition to its indefinitely long duration, long-term memory seems to be capable of holding as much information as a learner needs to store there. There's probably no such thing as "running out of room." In fact, for reasons you'll discover shortly, the more information already stored in long-term memory, the easier it is to learn new things.

Learning, Memory, and the Brain

Historically, researchers have believed that the physiological basis for most learning and memory lies in changes in the interconnections among neurons—in particular, in forming new synapses, strengthening existing ones, or eliminating counterproductive ones (e.g., Posner & Rothbart, 2007; Siegel, 2012; Trachtenberg et al., 2002). In addition, some learning may involve the formation of new neurons, especially in a structure called the *hippocampus*, and possibly also in certain areas of the cortex. New learning experiences appear to enhance the survival rate and maturation of the young neurons; without such experiences, these neurons slowly die away (Kaku, 2014; Leuner et al., 2004; Shors, 2014; Spalding et al., 2013).

Some neuroscientists have proposed that certain star-shaped cells in the brain, known as **astrocytes**, are just as important as neurons—possibly even more important—in learning and memory. In humans, astrocytes far outnumber neurons, have many connections with one another as well as with neurons, and appear to have considerable control over what neurons do and don't do and how much neurons communicate with one another. A normal brain produces many new astrocytes throughout its lifespan (X. Han et al., 2013; Koob, 2009; Oberheim et al., 2009).

Astrocytes are a subset of the brain's *glial cells*, described in Chapter 2.

As for *where* learning occurs, the answer is: many places. Key in the process is the *cortex*, the large, lumpy structure that covers the top and sides of the brain. The part of the cortex that's right behind the forehead—the *prefrontal cortex*—seems to be the primary headquarters for working memory and its central executive, although all of the cortex may be somewhat active in interpreting new input in light of previously acquired knowledge (Blair, 2016; Chein & Schneider, 2012; Gonsalves & Cohen, 2010; Nee et al., 2008). The hippocampus is also actively involved in learning, in that it pulls together the information it simultaneously receives from various parts of the brain (Davachi & Dobbins, 2008; Shohamy & Turk-Browne, 2013; Shors, 2014).

As you might guess, a healthy brain is essential for effective learning. The Applying Brain Research feature "Enhancing Students' Brain Functioning" presents four general recommendations that are grounded in brain research.

Critiquing the Three-Component Model

As mentioned earlier, the three-component model just described oversimplifies—and probably overcompartmentalizes—the nature of memory. For example, attention may be an *integral part* of working memory, rather than the separate entity depicted in Figure 7.1 (Cowan, 2007; Kiyonaga & Egner, 2014; Oberauer & Hein, 2012). Furthermore, studies conducted by neuroscientists and other researchers have yielded mixed results about whether working memory and long-term memory are distinctly different entities (e.g., Nee et al., 2008; Öztekin et al., 2010; Talmi et al., 2005).

Some psychologists have proposed that working memory and long-term memory simply reflect different **activation** states of a single memory (e.g., Anderson, 2005; Campo et al., 2005; Nee et al., 2008; Postle, 2016). According to this view, all information stored in memory is in either an active or an inactive state. Active information, which may include both incoming information and a certain bit of information previously stored in memory,

Applying Brain Research

Enhancing Students' Brain Functioning

We urge you to be cautious when you read books, articles, and websites about "brain-based learning," because many of them are speculative at best. Following are four recommendations that have a solid foundation in neuropsychological research.

- **Provide regular intellectual stimulation.** New, age-appropriate challenges and learning opportunities seem to enhance brain functioning (Kaku, 2014; Koob, 2009; Shors, 2014).
- **Remember that the brain also needs time for rest and reflection.** When it comes to stimulation, it's entirely possible to have too much of a good thing. Although we certainly don't want students to be bored during the day, we should occasionally give them some mental downtime in which their minds can productively wander a bit. Asking students to keep journals in which they write about their accomplishments and feelings can encourage regular self-reflection and enhance both mental health and academic achievement (Immordino-Yang et al., 2012). Some schools are also implementing yoga and meditation, which have the potential to reduce stress, and may help students to learn more effectively (Lemay et al., 2019).
- **Encourage physical exercise.** Physical exercise appears to be good for brain health, especially if it includes aerobic activities that keep the cardiovascular system in good working order. A particular benefit is enhancement of the functioning of the central executive—that component of working memory that controls attention, oversees the general flow of information throughout the memory system, and inhibits counterproductive thoughts (Bryck & Fisher, 2012; Castelli et al., 2007; Tomporowski et al., 2008).
- **Encourage and enable students to get enough sleep.** Unfortunately, typical school schedules, especially their early morning starting times, are poor matches with the sleeping patterns of high school students. As you well know, a good night's sleep improves mental alertness and can help people ward off illnesses. But in addition, sleep helps to firm up, or consolidate, new memories, rendering them more memorable over the long run (Kirby et al., 2011; Mazza et al., 2016; Scalise & Felde, 2017). Although we teachers may not have control of the timing of the school day, we can do other things that may enable our students to sleep well. For example, we might give them at least two or three days to complete homework assignments, and we can teach them strategies for overcoming any inclinations to procrastinate on doing their schoolwork.

is what people are currently paying attention to and thinking about—information we've previously described as being in working memory. As attention shifts, other pieces of information in memory become activated, and the previously activated information gradually fades into the inactive background. The bulk of information stored in memory is in an inactive state, such that people aren't consciously aware of it; this is information we've previously described as being in long-term memory.

Despite its imperfections, the three-component model can help us remember aspects of human learning and memory that we teachers should take into account as we plan and teach. For example, the model highlights the critical role of *attention* in learning, the *limited capacity* of attention and working memory, the *interconnectedness* of the knowledge that learners acquire, and the importance of *relating* new information to existing knowledge.

Long-Term Memory Storage

Learning Objective 7.3 **Apply your knowledge of long-term memory storage to identify effective strategies for enhancing students' learning.**

Regardless of whether we have three distinctly different components of our memories, we human beings remember a great many things for a considerable length of time—often for our entire lifespans. In this sense, at least, a good deal of what we know and can do is in long-term memory.

Information stored in long-term memory can be encoded in a variety of forms. A good deal of it is probably encoded *semantically*—as relatively abstract meanings and understandings. Some of it may also be encoded in a *verbal* form, perhaps as actual

Chapter 11 discusses the effects of feelings and emotions—which researchers often refer to as *affect*—in considerable detail.

words. Things you remember word for word (e.g., your name, your hometown, song lyrics) are all verbally encoded. Other information may be encoded as *imagery*—as it appears perceptually. For example, if, in your mind, you can see the face of a relative, hear that person's voice, or conjure up a mental whiff of the person's favorite fragrance, you're retrieving images. And certain *emotional reactions* are apt to be closely connected with some of the things you've stored in memory. For example, the thought of a beloved family member or favorite pet might immediately evoke a smile or sense of contentment, whereas the memory of a horror movie you've recently seen might still send shivers up your spine.

The preceding examples all illustrate **declarative knowledge**—knowledge that relates to the nature of *how things are, were, will be, or might be.* Declarative knowledge encompasses both general world knowledge (collectively known as *semantic memory*) and recollections of specific life experiences (collectively known as *episodic memory*). Yet people also acquire **procedural knowledge**; that is, they learn *how to do things* (e.g., Anderson, 1983; Phye, 1997; Tulving, 1983). You probably know how to ride a bicycle, wrap a birthday gift, and multiply a three-digit number by a two-digit number. To perform such actions successfully, you must adapt your behavior to changing conditions. For example, when you ride a bike, you must be able to turn left or right when an object blocks your path, and you must be able to come to a complete stop when you reach your destination. Accordingly, procedural knowledge often includes information about how to respond under different circumstances—it involves knowing *when to do certain things* either physically or mentally. In such instances it's also known as **conditional knowledge**.

Most declarative knowledge is **explicit knowledge**: Once we recall it, we're quite conscious of what it is we know. But a good deal of procedural knowledge is **implicit knowledge**: We can't consciously recall or explain it, but it affects our thinking or behavior nonetheless (Alexander et al., 2009; Anderson, 2005; Posner & Rothbart, 2007). Another difference is that declarative knowledge can sometimes be learned very quickly, perhaps after a single presentation, whereas procedural knowledge is often acquired slowly and only with considerable practice.

How Knowledge Is Organized

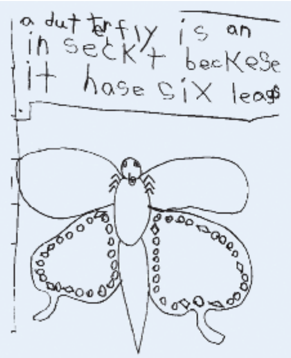
As we consider the nature of long-term memory storage, it's helpful to remember that to a considerable degree, learners *construct* their knowledge and understandings. In the process of constructing knowledge, learners often create well-integrated entities that encompass particular ideas or groups of ideas. For example, beginning in infancy, we form **concepts** that enable us to categorize objects and events (Mandler, 2011; Mandler, 2007; Quinn, 2002). Some concepts, such as *butterfly, chair,* and *backstroke,* refer to a fairly narrow range of objects or events. Other concepts are fairly general ones that encompass many more-specific concepts. For example, the concept *insect* includes ants, bees, and butterflies (e.g., see Figure 7.3), and the concept *swimming* includes the backstroke, dog paddle, and butterfly. In the examples here, notice how two different meanings of the word *butterfly* fall into two distinctly different category groups, which might lead you to follow a train of thought such as this one:

> horse → cowboy → lasso → rope → knot → Girl Scouts → camping → outdoors → nature → insect → butterfly → swimming

The idea that some concepts are nested within other, more general ones might remind you of the discussion of *class inclusion* in Chapter 2.

By combining objects or events into single entities, concepts take some of the strain off working memory's limited capacity (Mandler, 2011; Oakes & Rakison, 2003). For instance, the concept *molecule* takes very little "space" in working memory despite the many things we know about molecules, such as their composition and very tiny size. The Into the Classroom feature "Teaching Concepts" on page 250 offers suggestions for fostering concept learning in a variety of academic disciplines.

Figure 7.3 In his classification of a butterfly as an *insect*, 8-year-old Noah identifies one characteristic that all insects have—six legs—but correctly doesn't mention wings, which are optional.



Davis, Kevin

Learners also pull some concepts together into general understandings of what things are typically like. Such understandings are sometimes called **schemas** (e.g., Kalyuga, 2010; Rumelhart & Ortony, 1977; Schraw, 2006). For example, let's return once again to the concept *horse.* You know what horses look like, of course, and you can recognize one when you see one. Thus, you have a concept for *horse.* But now think about the many things you know *about* horses. What do they eat? How do they spend their time? Where are you most likely to see them? You can probably retrieve many facts about horses, perhaps including their fondness for oats and carrots, their love of grazing and running, and their frequent appearance in pastures and at racetracks. The various things you know about horses are closely interrelated in your long-term memory in the form of a "horse" schema.

People have schemas not only about objects but also about events. When a schema involves a predictable sequence of events related to a particular activity, it's sometimes called a **script**. The next exercise provides an example.

Experiencing Firsthand

John

Read the following passage *one time only.*

> John was feeling bad today so he decided to go see the family doctor. He checked in with the doctor's receptionist, and then looked through several medical magazines that were on the table by his chair. Finally, the nurse came and asked him to take off his clothes. The doctor was very nice to him. He eventually prescribed some pills for John. Then John left the doctor's office and headed home. (Bower et al., 1979, p. 190)

You probably had no trouble making sense of the passage because you've been to a doctor's office yourself and have a schema for how those visits usually go. You can therefore fill in a number of details that the passage doesn't tell you. For example, you probably inferred that John actually *went* to the doctor's office, although the story omits this essential step. Likewise, you probably concluded that John took off his clothes in the examination room, *not* in the waiting room, even though the story doesn't tell you where John did his striptease. When critical information is missing, as is true in the story about John, schemas and scripts often enable learners to fill in the gaps in a reasonable way.

On a much larger scale, humans—young children included—construct general understandings and belief systems, or **personal theories**, about particular aspects of the world (Barger & Linnenbrink-Garcia, 2017; Gelman, 2003; Keil & Newman, 2008). Such theories include many concepts and the relationships among them (e.g., correlation, cause-and-effect). To see what some of your own theories are like, try the exercise on page 250.

Chances are, you concluded that the coffeepot was transformed into a bird feeder but that the raccoon was still a raccoon despite its cosmetic makeover and stinky surgery. Now how is it possible that the coffeepot could be made into something entirely different, whereas the raccoon could not? Even young children seem to make a basic distinction between human-made objects (e.g., coffeepots, bird feeders) and biological entities (e.g., raccoons, skunks) (Gelman & Kalish, 2006; Inagaki & Hatano, 2006; Keil, 1986, 1989). For instance, human-made objects are defined largely by the *functions* they serve (e.g., brewing coffee, feeding birds), whereas biological entities are defined primarily by their origins (e.g., the parents who brought them into being, their DNA). Thus, when a coffeepot begins to hold birdseed rather than coffee, it becomes a bird feeder because its function has changed. But when a raccoon is cosmetically and surgically altered to look and smell like a skunk, it still has raccoon parents and raccoon DNA and so can't possibly *be* a skunk.

Into The Classroom

Teaching Concepts

- **Give an explicit definition.**

  A high school geometry teacher defines a *sphere* as "the set of points in three-dimensional space that are equidistant from a single point."

- **Highlight the characteristics that all or most examples of a concept possess.**

  A teacher illustrates the concept *insect* with a line drawing that emphasizes its three body parts, three pairs of legs, and two antennae in bold black lines. The drawing downplays other, irrelevant characteristics that might be visible, such as the insect's color and the presence of wings.

- **Present a best example—a prototype that captures the key elements of the concept.**

  To illustrate the concept *democracy*, a social studies teacher describes a hypothetical, ideal democratic government.

- **Present a wide range of examples in diverse contexts.**

  A music teacher plays a *primary chord* in several keys, first on a piano and then on a guitar.

- **Present nonexamples, especially near misses, to show what the concept is *not.***

  When a teacher describes what a *mammal* is, he explains why frogs and lizards don't fall into this category.

- **Ask students to identify examples and nonexamples from among numerous possibilities.**

  A language arts teacher gives students a list of sentences and asks them to identify the sentences that contain a *dangling participle*.

- **Ask students to generate their own examples of the concept.**

  A teacher asks students to think of examples of *adjectives* they frequently use in their own speech.

- **Show students how various concepts are related to one another—their similarities and differences, their hierarchical relationships, and so on.**

  A science teacher explains that the concepts *velocity* and *acceleration* have somewhat different meanings, even though they both involve speed.

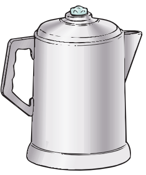
SOURCES: Best et al., 2006; Brophy et al., 2009; Carmichael & Hayes, 2001; Cook & Smith, 2006; Gagne, 1985; Ormrod, 2019; Rosch, 1977; Ross & Spalding, 1994; Tennyson & Cocchiarella, 1986.

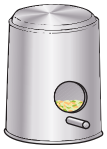
Experiencing Firsthand

Coffeepots and Raccoons

Consider each of the following situations:

1. People took a coffeepot that looked like Drawing A. They removed the handle, sealed the top, took off the top knob, sealed the opening to the spout, and removed the spout. They also sliced off the base and attached a flat piece of metal. They attached a little stick, cut out a window, and filled the metal container with birdseed. When they were done, it looked like Drawing B. After these changes, was this a coffeepot or a bird feeder?
2. Doctors took the raccoon in Drawing C and shaved away some of its fur. They dyed what was left black and then bleached a single white stripe down the center of the animal's back. Then, with surgery, they put in its body a sac of super-smelly odor, just like the smell a skunk has. After they were all done, the animal looked like Drawing D. After the operation, was this a skunk or a raccoon?


A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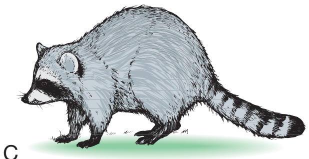
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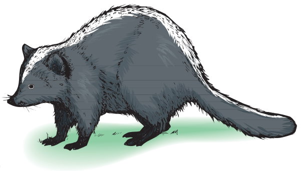

D

(Both scenarios based on Keil, F. C. (1989). *Concepts, kinds, and cognitive development*. Cambridge, MA: MIT Press, p. 184)

By the time children reach school age, they've already constructed basic theories about their physical, biological, social, and psychological worlds (Flavell, 2000; Geary, 2005; Gelman, 2003; Torney-Purta, 1994). In general, self-constructed theories help children make sense of and remember personal experiences, classroom subject matter, and other new information. Yet because children's theories often evolve with little or no guidance from more knowledgeable individuals, they sometimes include erroneous beliefs that interfere with new learning (more about this point in the discussion of *conceptual change* later in the chapter).

A child's *theory of mind* is an example of a self-constructed theory (see Chapter 3).

How Declarative Knowledge Is Learned

Much of the information that we teach to our students is in the form of declarative knowledge. When talking about the kinds of declarative knowledge acquired at school, there are several different processes that can support and impede our students' ability to store that information in long-term memory. Two contrasting processes are rote learning and meaningful learning (see Table 7.2).

Rote Learning Learners engage in **rote learning** when they try to learn and remember something without attaching much meaning to it. For example, in the "Letters and a Picture" exercise presented earlier, you would be engaging in rote learning if you tried to remember the letter string FAMILIARWORDS simply as a list of isolated letters or if you tried to remember the cowboy/bicycle drawing as a collection of random, unrelated lines and curves.

One common form of rote learning is **rehearsal**, repeating something over and over within a short timeframe (typically a few minutes or less), either by saying it aloud or by continuously thinking about it in an unaltered, verbatim fashion. Earlier we described how maintenance rehearsal—verbally repeating something over and over—helps us keep information in working memory. Contrary to what many students think, however, rehearsal is *not* an effective way of storing information in *long-term* memory. If a learner repeats something often enough, it might eventually "sink in," but the process is slow, laborious, not very effective, and not much fun. Furthermore, for reasons we'll identify later, people who use rehearsal and other forms of rote learning often have trouble remembering what they've learned (Anderson, 2005; Craik & Watkins, 1973; McDermott & Naaz, 2014). Verbally rehearsing information is probably better than not actively processing it at all, and rehearsal may be one of the few strategies students can use when they have little prior knowledge to draw on to help them understand new material (Wood et al. 1993). Ideally, though, we should encourage students to engage in meaningful learning when possible.

COMPARE/CONTRAST

Table 7.2 Long-Term Memory Storage Processes

Process	Definition	Example	Effectiveness
Rote learning: Learning primarily through repetition and practice, with little or no attempt to make sense of what is being learned			
Rehearsal	Repeating information verbatim, either mentally or aloud	Word-for-word repetition of a formula or definition	Relatively ineffective: Storage is slow, and later retrieval is difficult
Meaningful learning: Making connections between new information and prior knowledge			
Elaboration	Embellishing on new information based on what one already knows	Generating possible reasons that prominent people in history made the decisions they did	Effective if associations and additions made are accurate and productive
Internal organization	Making connections among various pieces of new information	Thinking about how one's lines in a play relate to the play's overall story line	Effective if organizational structure is legitimate and consists of more than just a list of discrete facts
Visual imagery	Forming a mental picture of something, either by actually seeing it or by envisioning how it might look	Imagining how various characters and events in a novel might have looked	Individual differences in effectiveness; especially beneficial when used in combination with elaboration or organization

Meaningful Learning In contrast to rote learning, **meaningful learning** involves recognizing a relationship between new information and one or more things already stored in long-term memory. Whenever we use such words as *comprehension* and *understanding,* we're talking about meaningful learning. In the vast majority of cases, meaningful learning is more effective than rote learning for storing information in long-term memory. It's especially effective when learners relate new ideas not only to what they already know about the world but also to what they know or believe about *themselves*—for instance, to self-descriptions or personal life experiences (Craik, 2006; Nairne & Pandeirada, 2016). Meaningful learning takes a variety of forms. Three forms that researchers have studied in depth are elaboration, **organization**, and visual imagery. All three are *constructive* in nature: They involve combining several pieces of information into a meaningful whole.

Elaboration. In **elaboration**, learners use their prior knowledge to embellish on a new idea, thereby storing *more* information than was actually presented. For example, when a student learns that the crew on Christopher Columbus's first trip across the Atlantic threatened to revolt, the student might speculate, "I bet the men were really frightened when they continued to travel west day after day without ever seeing signs of land."

As we'll see later in the chapter, learners sometimes elaborate on new information in inaccurate and counterproductive ways. In general, however, the more students elaborate on new material—that is, the more they use what they already know to help them understand and interpret new material—the more effectively they will store and remember it. Thus, students who regularly elaborate on what they learn in school usually show higher achievement than those who simply take information at face value (Anderson, 2005; McDaniel & Einstein, 1989; Paxton, 1999).

One effective way to encourage elaboration is to have students talk or write about a topic—for instance, to summarize what they've learned, relate new concepts to their personal experiences, or express and defend certain positions on controversial topics (e.g., Bangert-Drowns et al., 2004; Shanahan, 2004). Another good strategy is to ask questions that require students to draw inferences from or in some other way expand on something they've just learned — questions such as "How would you use . . . to . . . ?" and "What do you think would happen if . . . ?" (Elleman, 2017; King, 1992, p. 309; McCrudden & Schraw, 2007). Still another approach is to have students work in pairs or small groups to formulate and answer their *own* elaborative questions. Different researchers call such group questioning either *elaborative interrogation* or *guided peer questioning* (Dunlosky et al., 2013; King, 1994, 1999; Ozgungor & Guthrie, 2004). In the following dialogue, fifth graders Katie and Janelle are working together to study class material about tide pools. Katie's job is to ask Janelle questions that encourage elaboration:

> ***Katie:*** How are the upper tide zone and the lower tide zone different?
>
> ***Janelle:*** They have different animals in them. Animals in the upper tide zone and splash zone can handle being exposed—have to be able to use the rain and sand and wind and sun—and they don't need that much water and the lower tide animals do.
>
> ***Katie:*** And they can be softer 'cause they don't have to get hit on the rocks.
>
> ***Janelle:*** Also predators. In the spray zone it's because there's predators like us people and all different kinds of stuff that can kill the animals and they won't survive, but the lower tide zone has not as many predators.
>
> ***Katie:*** But wait! Why do the animals in the splash zone have to survive? (King, 1999, p. 97)

Notice that the two girls are continually relating the animals' characteristics to survival in different tidal zones, and eventually Katie asks why animals in the splash

Encourage students to go beyond the specific information they have learned—for instance, to draw inferences, speculate about possible implications, or defend a position about a controversial topic. Occasionally, have students work in pairs or small groups to formulate and ask one another elaborative questions.

zone even *need* to survive. Such analyses are quite sophisticated for fifth graders. Just imagine what high school students might be able to do as they become increasingly capable of abstract and hypothetical thinking!

Chapter 2 describes the development of abstract and hypothetical thinking in adolescence.

Internal organization. Generally, we humans learn and remember new information more easily when we pull it together in some reasonable way (e.g., McNamara & Magliano, 2009; Nesbit & Adesope, 2006; Robinson & Kiewra, 1995). Such **internal organization** involves making connections among various pieces of new information and forming an overall cohesive structure. For example, a learner might group information into categories, as you probably did in the "Remembering 12 Words" exercise near the beginning of the chapter.

An even better way of organizing information is to identify interrelationships among its various parts. For instance, when learning about *velocity, acceleration, force,* and *mass* in a physics class, a student might better understand these concepts by seeing how they're interconnected—perhaps by learning that velocity is the product of acceleration and time ($v = a \times t$) and that an object's force is determined by both its mass and its acceleration ($f = m \times a$). The trick is not simply to memorize the formulas (that would be rote learning) but rather to make sense of the relationships that the formulas represent.

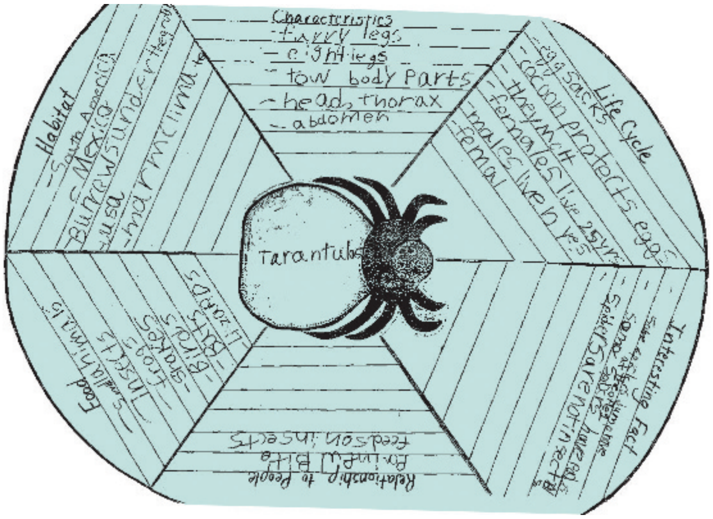
Explicitly show how various ideas are interrelated.

It's often helpful to give students specific structures they can use to organize information. For example, the weblike notetaking form shown in Figure 7.4 can help elementary students organize what they learn about tarantulas. Another effective structure is a two-dimensional matrix or table that enables students to compare several items with respect to various characteristics—for instance, how various geographical regions differ in topography, climate, economic activities, and cultural practices (Atkinson et al., 1999; Kiewra et al., 1988; Robinson & Kiewra, 1995). A third approach is to teach students how to create **concept maps**—diagrams that depict the concepts of a unit and their interrelationships (Hattie, 2009; Nesbit & Adesope, 2006; Novak, 1998). Figure 7.5 shows concept maps that two different students might construct after a lesson about gorillas. The concepts themselves are circled, and their interrelationships are indicated by lines with words or short phrases. Several student-friendly concept-mapping software programs are available for creating and modifying concept maps quickly and easily; three examples are Coggle, Kidspiration, and Text-2-Mind-Map.

Give students specific tools to help them organize what they're learning.

Not only can self-constructed organizational structures help students learn more effectively, but they can also help teachers *assess* students' learning. For example, the concept map on the left side of Figure 7.5 reveals only spotty, fragmented knowledge about gorillas. Furthermore, the student has two ideas that need correction. First, contrary to a common stereotype, gorillas don't regularly swing from trees, although young ones may occasionally climb a tree to escape danger. Second, gorillas aren't especially "fierce" creatures. For the most part, they live a peaceful existence within their family group; they get nasty (e.g., by beating their chests) only when an unfamiliar human, non-family-member gorilla, or other potential encroacher threatens their territory.

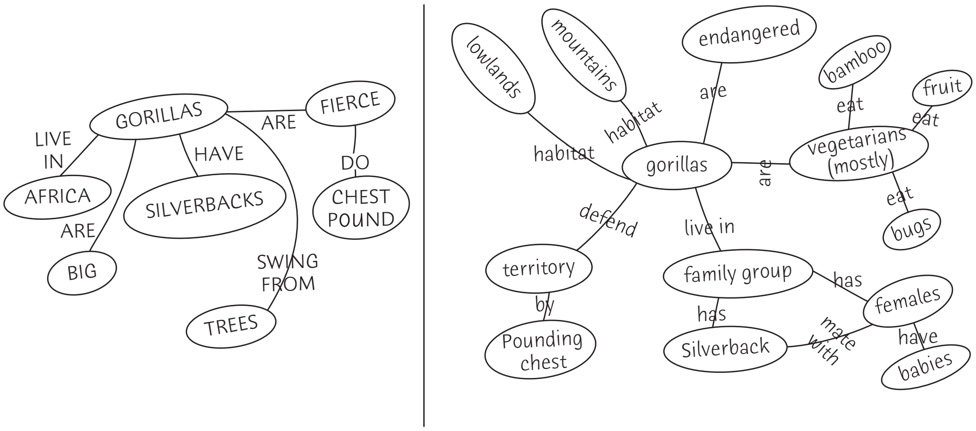
Figure 7.4 Using a form his second-grade teacher has provided, 7-year-old Tony organizes what he has learned about tarantulas.



Student material. 7-year-old Tony

Visual imagery. Earlier we mentioned imagery as one possible way in which information might be encoded in long-term memory. Many research studies have shown that **visual imagery**—forming mental pictures of objects or ideas—can be a highly effective method of storing information (Sadoski & Paivio, 2001; Schwartz & Heiser, 2006; Urgolites & Wood, 2013). We authors are

Figure 7.5 Two concept maps about gorillas, one of which reveals errors in understanding.


GORILLAS
ARE
FIERCE
LIVE IN
AFRICA
HAVE
SILVERBACKS
DO
CHEST POUND
ARE
BIG
SWING FROM
TREES
lowlands
mountains
endangered
bamboo
fruit
habitat
habitat
are
eat
eat
vegetarians (mostly)
gorillas
are
eat
bugs
defend
live in
territory
family group
has
by
has
females
Pounding chest
Silverback
mate with
have
babies

classifying it as a form of meaningful learning in part because it often involves making use of other visual images that are already stored in long-term memory.

To show you how effective visual imagery can be, the next exercise will teach you a few words in Mandarin Chinese.

Experiencing Firsthand

Five Chinese Words

Try learning these five Chinese words by forming the visual images we describe (don't worry about learning the tone marks over the words):

Chinese Word	English Meaning	Image
fáng	house	Picture a *house* with *fangs* growing on its roof and walls.
mén	door	Picture a restroom *door* with the word *MEN* painted on it.
kè	guest	Picture someone giving someone else (the *guest*) a *key* to the house.
fàn	food	Picture a plate of *food* being cooled by a *fan*.
shū	book	Picture a book sticking out of a shoe.

Now find something else to do for a couple of minutes. Stand up and stretch, get a glass of water, or use the restroom. But be sure to come back to your reading in just a minute or two.

Now that you're back, cover the list of Chinese words, English meanings, and suggested visual images. Then try to remember what each word means:

kè fàn mén fáng shū

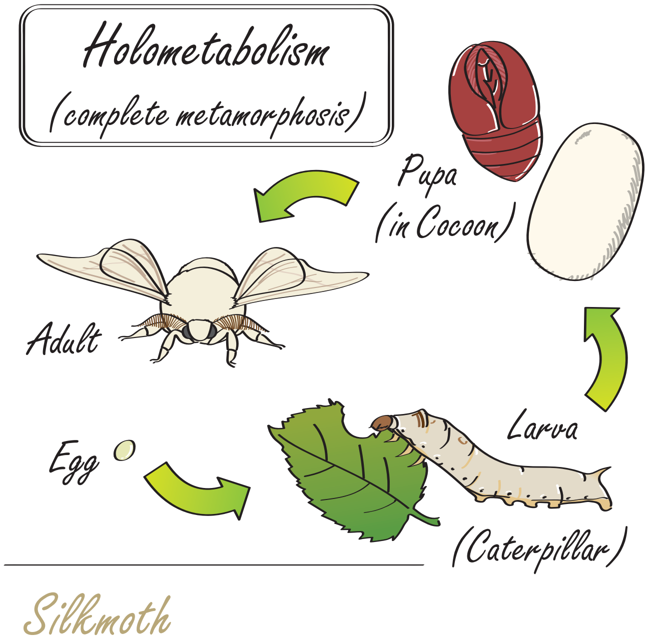
Did the Chinese words remind you of the visual images you stored? Did the images, in turn, help you remember the English meanings? You may have remembered all five words easily, or you may have remembered only one or two. People differ in their ability to use visual imagery: Some form images quickly and easily, whereas others form them only slowly and with difficulty (Behrmann, 2000; Clark & Paivio, 1991; Kosslyn, 1985).

Illustrate verbal instruction with visual materials (e.g., pictures, maps, diagrams).

In the classroom, we can encourage the use of visual imagery in several ways. We can ask students to imagine how certain events in literature or history might have looked (Johnson-Glenberg, 2000; Sadoski & Paivio, 2001). We can provide visual materials (pictures, charts, graphs, etc.) that illustrate important but possibly abstract ideas (Atkinson et al., 1999; Carlson et al., 2003; Verdi et al., 1996). We can also ask students to create their *own* illustrations or diagrams of the things they're studying, such as a student's depiction of the life cycle of a silkworm shown in Figure 7.6 (Schwamborn et al., 2010; van der Veen, 2012; Van Meter & Garner, 2005).

Visual imagery can be especially powerful when used in combination with other forms of encoding. For example, students more readily learn and remember information they receive in both a verbal form (e.g., a lecture or textbook passage) and a graphic form (e.g., a picture, map, or diagram) (Mayer, 2011; Moreno, 2006; Rau et al., 2015). They're also likely to benefit from being explicitly asked to represent information both verbally and visually—that is, as both words and pictures.

Figure 7.6 A student's depiction of the life-cycle of a silkworm



JNeophoeus S. Chuang/Shutterstock

Developmental Trends in Storage Processes for Declarative Information Meaningful learning—relating new information to prior knowledge—probably occurs in one form or another at virtually all ages. More specific strategies—such as rehearsal, internal organization, and visual imagery—are fairly limited in the early elementary years but increase in both frequency and effectiveness over the course of childhood and adolescence. The frequency of elaboration—especially as a process that learners *intentionally* use—picks up a bit later, often not until adolescence, and is more common in high-achieving students. Table 7.3 provides more detailed information on the nature of long-term memory storage processes at different grade levels.

How Procedural Knowledge Is Learned

Some of the procedures people learn—for example, baking a cake, serving a volleyball, and driving a car—consist primarily of overt behaviors. Many others—for example, writing a persuasive essay, solving for *x* in an algebraic equation, and surfing the internet—have a significant mental component as well. Many procedures involve a combination of physical behaviors and mental activities.

Procedural knowledge ranges from relatively simple actions (e.g., using scissors or correctly holding a pencil) to far more complex skills. Complex procedures usually aren't learned in one attempt; instead, they're acquired slowly over time, often only with a great deal of practice (Ericsson, 2003; Macnamara et al., 2014; Proctor & Dutta, 1995).

People appear to learn simple physical procedures primarily as actual behaviors—in other words, as specific actions that, with practice, are strengthened and gradually refined (Ennis & Chen, 2011; Féry & Morizot, 2000; Willingham, 1999). Yet many complex skills, especially those that have a mental component, may also be learned as declarative knowledge—in other words, as *information* about how to do something (Anderson, 1983; Baroody et al., 2013; Beilock & Carr, 2004). Learners may initially use their declarative knowledge to guide them as they perform a new skill, but to the extent that they must do so, their performance is apt to be slow and laborious and to require a lot of concentration—that is, it can consume considerable working memory capacity. As learners continue to practice the skill, their declarative knowledge gradually evolves into procedural knowledge, perhaps eventually to the point that they can perform the activity quickly, efficiently, and effortlessly. People who show exceptional talent in a particular skill—say, in figure skating or playing the piano—typically practice a great

DEVELOPMENTAL TRENDS

Table 7.3 Typical Long-Term Memory Storage Processes at Different Grade Levels

Grade Level	Age-Typical Characteristics	Example	Suggested Strategies
K–2	• Occasional organization of concrete physical objects as a strategy for remembering them • Gradual emergence of rehearsal to remember verbal material, but not always used effectively • Emerging ability to use visual imagery to enhance memory, especially if an adult suggests this strategy • Few intentional strategic efforts to learn new things	At the end of the day, a first-grade teacher reminds students that they need to bring three things to school tomorrow: an object that begins with the letter *W*, a signed permission slip for a field trip, and a warm jacket to wear on the trip. Six-year-old Cassie briefly mumbles "jacket" to herself a couple of times and naively assumes she'll remember all three items without any further mental effort.	• Get students actively involved in topics (e.g., through hands-on activities or fantasy play) as a way of helping them remember new ideas. • Relate topics to students' prior experiences. • Model rehearsal as a strategy for remembering things over the short run. • Provide pictures that illustrate verbal material. • Give students short notes they can take home to help them and their parents remember items that need to be brought to school.
3–5	• Spontaneous, intentional, and increasingly effective use of rehearsal to remember things for a short time • Increasing use of organization as an intentional learning strategy for verbal information • Increasing effectiveness in the use of visual imagery as a learning strategy	As 10-year-old Jonathan studies for an upcoming quiz on clouds, he looks at the photos of four different kinds of clouds in his science book and says each one's name aloud. Then he repeats the four cloud types several times: "Cumulus, cumulonimbus, cirrus, stratus, cumulus, cumulonimbus, cirrus, stratus . . ."	• Emphasize the importance of making sense of, rather than memorizing, information. • Suggest possible ways that students can organize new information. • Provide a variety of visual aids to facilitate visual imagery and suggest that students create their own drawings or visual images of things they need to remember.
6–8	• Predominance of rehearsal as a learning strategy • Greater abstractness and flexibility in categories used to organize information • Emergence of elaboration as an intentional learning strategy	Middle-school students Raj and Owen are studying for a quiz on various kinds of rocks. "Let's group them somehow," Raj says. Owen suggests grouping them by color (gray, white, reddish, etc.). But after further discussion, the boys agree that sorting them into *sedimentary*, *igneous*, and *metamorphic* would be a more strategic approach.	• Suggest questions that students might ask themselves as they study; emphasize questions that promote elaboration (e.g., "Why would ______ do that?" "How is ______different from ______?"). • In assignments and quizzes, assess true understanding rather than rote memorization.
9–12	• Continuing reliance on rehearsal as an intentional learning strategy, especially by low-achieving students • Increasing use of elaboration and organization to learn, especially by high-achieving students	In her high school history class, Kate focuses her studying efforts on memorizing names, dates, and places. Meanwhile, her classmate Janika likes to speculate about the personalities and motives of such historical characters as Alexander the Great, Napoleon Bonaparte, and Adolf Hitler.	• Ask thought-provoking questions that engage students' interest and help students see the relevance of topics to their own lives. • Have students work in mixed-ability cooperative groups, in which high-achieving students can model effective learning strategies for low-achieving students.

SOURCES: Bjorklund & Coyle, 1995; Bjorklund et al., 1994; Cowan et al., 2006; DeLoache & Todd, 1988; Gaskins & Pressley, 2007; Gathercole & Hitch, 1993; Horn et al., 2021; Kosslyn et al., 1990; Kunzinger, 1985; Lehmann & Hasselhorn, 2007; Marley et al., 2008; Newman, 1990; Ornstein et al., 2010; Plumert, 1994; Pressley & Hilden, 2006; Schneider & Pressley, 1989.

deal, often a minimum of three to four hours a day over a period of 10 years or more (Ericsson, 1996; Horn, 2008).

Some of the storage processes we've already discussed play a role in acquiring procedural knowledge as well as declarative knowledge. For instance, verbally rehearsing a sequence of steps in a motor skill enhances people's ability to perform the skill (Vintere et al., 2004; Weiss & Klint, 1987). Illustrations or live demonstrations of a procedure, which presumably foster visual imagery, are also beneficial (Kitsantas et al., 2000; SooHoo et al. 2004). Students can often find such demonstrations on the internet, on sites such as YouTube, but caution needs to be taken, as the accuracy of such demonstrations is not guaranteed. In fact, imagining *oneself* performing a new skill (e.g., executing a basketball shot or gymnastics move) can enhance acquisition of the skill, although this strategy obviously isn't as effective as actual practice (Feltz et al., 1988; Kosslyn, 1985; SooHoo et al., 2004).

Chapter 9 explains how some procedural knowledge is an integral part of a culture's *communities of practice*. Chapter 10 offers suggestions for effectively modeling new behaviors for students.

Perhaps the most effective way to teach new procedures is to model them for students, including both the overt behaviors and the internal thought processes involved. The Into the Classroom feature "Helping Students Acquire New Procedures" illustrates several additional strategies for facilitating procedural learning.

Into The Classroom

Helping Students Acquire New Procedures

- **Help students understand the logic behind the procedures they are learning.**

  As a teacher demonstrates the correct way to swing a tennis racket, she asks her students, “Why is it important to have your feet apart rather than together? Why is it important to hold your arm straight as you swing?”

- **When skills are especially complex, break them into simpler tasks that students can practice one at a time.**

  Knowing how overwhelming the task of driving a car can initially be, a driver education teacher begins behind-the-wheel instruction by having students practice steering and braking in an empty parking lot. Only later, after students have mastered these skills, does she have them drive in traffic on city streets.

- **Provide mnemonics that can help students remember a sequence of steps.**

  A math teacher shows students how to multiply in the expression.

  $$(3x + 4)\,(2x + 5)$$

  by working out the steps on the board. As she goes along, she explains what she’s doing: “The word *FOIL* can help you remember what you need to do. You begin by multiplying the two *first* terms inside the parentheses—that would be $3x \times 2x$, or $6x^2$. Then you multiply the two *outer* terms—$3x \times 5$—which gives you $15x$. After that, you multiply the two *inner* terms—$4 \times 2x$—which gives you 8x. Finally, you multiply the two *last* terms—4×5, which equals 20. Add them all together, and you get $6x^2 + 23x + 20$.”

- **Give students many opportunities to practice new skills and provide the feedback they need to help them improve.**

  A science teacher asks his students to write lab reports after each week’s lab activity. As he grades the reports, he writes numerous short comments in the margins. Some comments describe the strengths he sees, and others provide suggestions for making future reports more objective, precise, or clear.

SOURCES: Alexander & Judy, 1988; Anderson et al., 1996; Baroody et al., 2013; Beilock & Carr, 2004; Ennis & Chen, 2011; Hattie & Timperley, 2007; Hecht et al., 2003; Macnamara et al., 2014; Proctor & Dutta, 1995; Shute, 2008; van Merrienboer & Kester, 2008.

Roles of Prior Knowledge and Working Memory in Long-Term Memory Storage

Students are more likely to engage in meaningful learning when they have a relevant **knowledge base**—that is, when they have existing knowledge to which they can connect whatever new information and skills they’re trying to master. When, in contrast, they have little relevant knowledge on which to build, they’re apt to struggle in their efforts to make sense of new material.

Occasionally, students’ prior knowledge interferes with something they need to learn. For example, many students believe that plants draw their food from soil, through their roots. This “knowledge” can make it more difficult for them to learn about photosynthesis. In general, a relevant knowledge base helps students learn and remember new material more effectively than they would otherwise (e.g., Alexander et al., 1994; Kintsch, 2009; Morgan et al., 2016) although differences may exist across subject domains (Simonsmeier et al., 2022). For example, students will better understand scientific principles if they’ve already seen those principles in action, either in their personal lives or in the classroom, and they’ll better understand how big some dinosaurs were if they have previously seen skeletons of, say, a Diplodocus and a Tyrannosaurus at a natural history museum.

Children’s knowledge about the world grows by leaps and bounds every year; on average, then, older students have more knowledge to help them understand and elaborate on new ideas and events than younger ones do. Children don’t all acquire the *same* knowledge bases, of course, and their differing knowledge can lead them to construct different meanings from the same situation. The next exercise illustrates this point.

Provide concrete experiences (lab experiments, museum visits, etc.) to which students can relate more abstract ideas.

Experiencing Firsthand

Rocky

Read the following passage *one time only:*

> Rocky slowly got up from the mat, planning his escape. He hesitated a moment and thought. Things were not going well. What bothered him most was being held, especially since the charge against him had been weak. He considered his present situation. The lock that held him was strong, but he thought he could break it. He knew, however, that his timing would have to be perfect. Rocky was aware that it was because of his early roughness that he had been penalized so severely—much too severely from his point of view. (Anderson et al. 1977, p. 372)

Now summarize what you've just read in two or three sentences.

What did you think the passage was about? A prison escape? A wrestling match? Or perhaps something else altogether? When a longer version of this passage was used in an experiment with college students, many physical education majors interpreted it as a wrestling match, but music education majors—most of whom had little or no knowledge of wrestling—were more likely to think it was about a prison break (Anderson et al., 1977).

Yet it isn't enough that students have the knowledge they need to make sense of new material. They must also be *aware* that some of their existing knowledge is relevant. They must retrieve that knowledge from long-term memory while thinking about the new material, so that *they have both the old and the new in working memory at the same time and thus can make the appropriate connections* (Bellezza, 1986; Glanzer & Nolan, 1986; Kalyuga, 2010).

As teachers, we should use students' existing knowledge as a starting point whenever we introduce a new topic. Furthermore, we should explicitly remind students of things they know that are related to new content—an instructional strategy called **prior knowledge activation**. For instance, we might begin a first-grade unit about plants by asking students to describe what their parents do to keep flowers or vegetable gardens growing. In a secondary English class, we might introduce Sir Walter Scott's *Ivanhoe* (in which Robin Hood is a major character) by asking students what they know about Robin Hood. We should also remember that students from diverse cultural backgrounds may have somewhat different knowledge bases, and adjust our starting points accordingly (Fox, 2009; Matthews et al., 2013; McIntyre, 2010; Nelson-Barber & Estrin, 1995).

Begin instruction with what students already know and help them make connections between the "new" and the "old."

Furthermore, we should encourage students to retrieve relevant knowledge *on their own* as they study. One approach is to model this strategy for students. For example, we might read aloud a portion of a textbook, stopping occasionally to tie an idea in the text to something previously studied in class or to something in our own personal experience. We can then encourage students to do likewise, giving suggestions and guiding their efforts as they proceed. When students are reading using electronic devices such as a tablet or a laptop, some programs allow teachers to embed prompts and questions that can cue students to relate what they are reading to prior knowledge. Especially when working with students in the elementary grades, we might also want to provide specific questions that encourage students to reflect on their existing knowledge and beliefs as they read and study—for instance, asking themselves, "What do I already know about this topic?" and "Might I discover that something I think about this topic isn't correct?" (Baer & Garrett, 2010; Spires & Donley, 1998; Thompson & Carr, 1995).

As students begin a reading assignment, encourage them to think about what they already know and believe about a topic.

Encouraging a Meaningful Learning Set and Conceptual Understanding

We can't always blame students when they take a relatively meaning*less* approach to their studies. Inadvertently, some teachers tend to encourage students to learn school subjects by rote. Think back to your own experiences in school. How many times were you allowed to define a word by repeating its dictionary definition, rather than being expected to explain it in your own words? In fact, how many times were you *required* to learn something word for word? And how many times did an exam assess your knowledge of facts or principles without ever assessing your ability to relate those facts and principles to everyday life or to things you learned in previous lessons or courses? When assignments and assessments require memory of isolated facts—and perhaps even require word-for-word recall, like the test that Elijah and Mia have to take on capitals of European countries—students are apt to engage in rote rather than meaningful learning, believing that a rote-learning approach will yield them better grades (Crooks, 1988; Frederiksen, 1984; Shepard et al., 2005).

Rather than inadvertently encouraging rote learning, we should explicitly encourage students to adopt a **meaningful learning set**—an earnest effort to *understand* rather than simply memorize material. For example, we might frequently ask students to explain their reasoning, and our assignments and assessment tasks should require true understanding rather than rote memorization (Ausubel et al., 1978; Middleton & Midgley, 2002; Shepard et al., 2005).

Ideally, students should acquire a **conceptual understanding** of topics; that is, they should form logical connections among related concepts and principles. For example, rather than simply memorize basic mathematical computation procedures, students should learn how those procedures reflect underlying principles of mathematics. And rather than learn historical facts as lists of unrelated people, places, and dates, students should place those facts within the context of general social trends, migration patterns, economic conditions, and other relevant phenomena. The more interrelationships students form within the subject matter they're learning—in other words, the better they *internally organize* it—the more easily they'll be able to remember and apply it later on (Baroody et al., 2013; Linn & Eylon, 2011; White & Rumsey, 1994).

Constructing an integrated understanding of any complex topic inevitably takes time. Accordingly, many experts advocate the principle *Less is more: Less* material studied thoroughly (rather than superficially) is learned *more* completely and with greater understanding. Following are several more specific strategies for promoting conceptual understanding of subject matter:

- Organize units around a few core ideas or themes, always relating specific content back to this core.
- Explore each topic in depth—for example, by considering many examples, examining cause-and-effect relationships, and discovering how specific details relate to more general principles.
- Regularly connect new ideas to students' personal experiences and to things students have previously learned.
- Emphasize that conceptual understanding is far more important than knowledge of specific facts—not only through the statements you make but also through the questions you ask, the assignments you give, and the criteria you use to evaluate achievement.
- Ask students to teach what they've learned to others. Teaching others encourages them to focus on and pull together main ideas in ways that make sense (Brophy, 2004; Brophy et al., 2009; Hatano & Inagaki, 1993; Leung, 2015; Middleton & Midgley, 2002; Perkins & Ritchhart, 2004; Roscoe & Chi, 2007; VanSledright & Brophy, 1992; White & Rumsey, 1994).

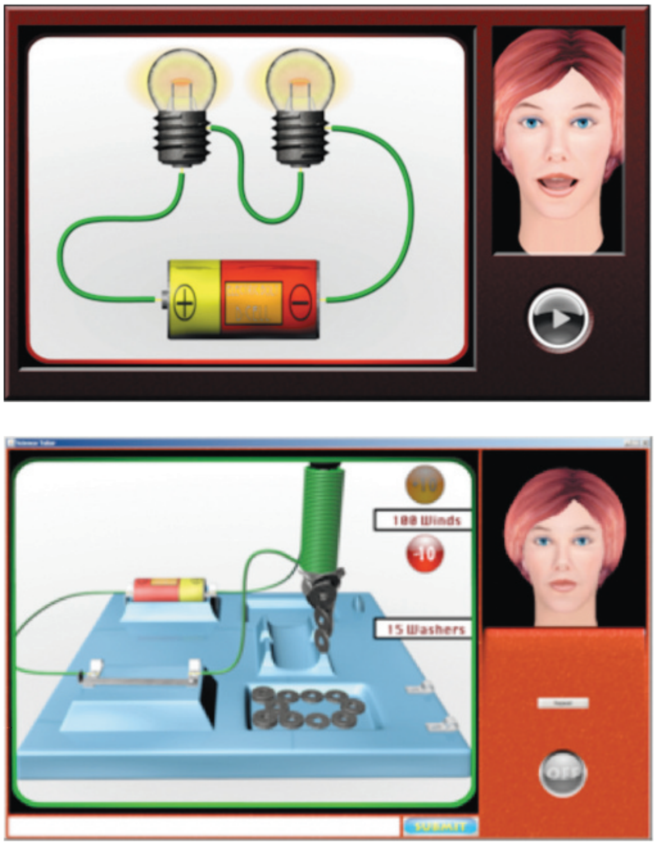
Using Technology to Facilitate Meaningful Learning

Wide variability in students' current knowledge and skills often calls for some degree of individualized instruction. Different students may need different "starting points" in their explorations of new topics, and some students may require more practice than others before they can completely master new skills. Many instructional software programs—often referred to as **computer-based instruction (CBI)**—are specifically designed to take individual differences into account. Effective CBI programs embody many basic principles of cognitive psychology. For instance, they capture and hold students' attention with engaging tasks and graphics, encourage students to relate new ideas to things they already know, present diverse examples and practice exercises, and provide constructive feedback that explains *why* each student response is either good or not-as-good. Some forms of CBI are housed within a single software program; many others are available on the internet.

Consider using well-designed computer software programs to accommodate individual differences in students' prior knowledge and skills.

Some instructional software programs provide drill and practice of basic knowledge and skills (e.g., math facts, typing, fundamentals of music). Others, known as **intelligent tutoring systems**, skillfully guide students through complex subject matter and can anticipate and address a wide variety of misconceptions and learning difficulties. A good example of an intelligent tutoring system is *My Science Tutor*, or *MyST*, in which students in the upper elementary grades have one-on-one conversations with "Marni," a computer-animated adult who both talks to them and—through the software's voice recognition and language-processing components—also listens to and understands what they say in response to her questions (W. Ward et al., 2013). Marni typically begins a conversation with a student by activating the student's prior knowledge about the topic, saying something such as "What have you been studying in science recently?" Then, after the topic of the lesson has been identified, Marni presents a series of illustrations, animations, and interactive simulations and asks more specific questions—for instance, she might ask, "So, what's going on here?" or "What could you do to…?" (W. Ward et al., 2013, pp. 1118–1119). She tailors subsequent instruction to the student's current understandings and addresses any misconceptions she "thinks" they might have. Figure 7.7 presents examples of what a student might see on the computer screen in lessons on electric circuits and electromagnetism, respectively.

Figure 7.7 In the intelligent tutoring system *My Science Tutor (MyST)*, elementary school students converse one on one with a virtual tutor, "Marni," who asks questions, "listens" to their answers, and tailors follow-up instruction accordingly. The top screenshot shows Marni asking a question about an animated electric circuit. The bottom one shows Marni "listening" as a student experiments with an electromagnet, either increasing or decreasing the number of times the wire winds around the metal core to see its possible effects on the magnet's strength.



Well-designed CBI programs can be quite effective in helping students learn academic subject matter (e.g., Kulik & Fletcher, 2016; Slavin & Lake, 2008; Steenbergen-Hu & Cooper, 2013; Tamin et al., 2011; Van der Kleij et al., 2015; Xu et al., 2019). They can also be highly motivating, piquing students' interest, providing occasional opportunities for choice-making, and ensuring the kinds of success experiences that are likely to enhance students' self-confidence (Blumenfeld et al., 2006; Means et al., 2014; Swan et al., 1990). Some research suggests that when visual images that are presented during instruction via technology are presented again during a subsequent test or quiz, students may be better able to remember what they had learned (Schneider et al., 2020). But one caveat is in order here: Too *much* independence in choice-making in a program can lead students to flounder aimlessly and not make much progress in their learning. Effective CBI programs provide considerable guidance about what students should do at various steps along the way (Kanar & Bell, 2013; Karich et al., 2014).

Computer-based instructional programs offer several advantages that we sometimes don't have with more traditional forms of instruction. For one thing, CBI can seamlessly include animations, video clips, and spoken messages—components that aren't possible with printed materials. Second, a computer can record and maintain ongoing data for every student, including such information as how far each student has progressed in a program, how quickly they respond to questions, and how often they're right and wrong. With such data, we can monitor each student's progress and identify students who appear to be struggling with the material. Finally, as we all learned during the Covid-19 pandemic, technology can be used to provide instruction when in-person instruction isn't feasible. For example, in many instances of **online learning**, learners receive instruction either at a physical location far away from an instructor or without any human instructor at all. Although much additional research on the effectiveness of online learning on P–12 students is needed, currently available research suggests that, in general, **distance learning** programs are more effective in English/language arts than in mathematics (Sahni et al., 2021).

Using Mnemonics in the Absence of Relevant Prior Knowledge

Some things are hard to make sense of—that is, hard to learn meaningfully. For instance, why do bones in the human body have such names as *fibula, humerus,* and *ulna?* And why is Albany the capital of the state of New York, rather than, say, New York City? From most students' perspectives, there's no rhyme or reason to such facts.

When students have trouble finding relationships between new material and their prior knowledge, or when a body of information seemingly has no organizational structure (as is true for many lists), special memory tricks known as **mnemonics** can help students remember material more effectively. Four commonly used mnemonics—verbal mediation, the keyword method, superimposed meaningful structures, and the loci method—are described in Figure 7.8

Research consistently supports the effectiveness of using mnemonics in learning (e.g., Atkinson et al., 1999; Pressley et al., 1982; Soemer & Schwan, 2012; Twomey & Kroneisen, 2021). Mnemonics are effective because they help learners to find some sort of meaning in what might otherwise be nonsensical information. The artificial organization structure that some mnemonics provide is an additional plus. Imposing rhythm on a body of information—for instance, embedding the information in a song or hip-hop lyrics—is one way of giving it structure and can be especially beneficial when music is a significant part of students' cultures (Allen & Boykin, 1991; Barton et al. 2008; Tyler, Uqdah, et al., 2008).

Suggest helpful mnemonics when new information is difficult to learn meaningfully and teach students how to create their own mnemonics.

When Knowledge Construction Goes Awry: Addressing Learners' Misconceptions

Learning Objective 7.4 Explain how students' self-constructed beliefs can sometimes interfere with effective learning, and identify several ways of helping students productively revise such beliefs.

When learners construct their own understandings, there's no guarantee that they'll construct accurate ones. Occasionally, they may instead construct **misconceptions**—beliefs that are inconsistent with commonly accepted and well-validated explanations of phenomena or events. For example, in science, some of students' beliefs might be at odds with data collected over the course of decades or centuries of

Figure 7.8 Common mnemonic techniques.

VERBAL MEDIATION

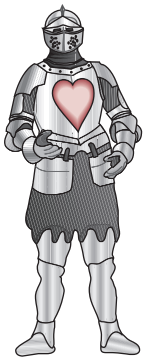
A **verbal mediator** is a word or phrase that creates a logical connection, or "bridge," between two pieces of information. Verbal mediators can be used for paired pieces of information such as foreign-language words and their English meanings, countries and their capitals, and chemical elements and their symbols. Following are examples:

Information to Be Learned	Verbal Mediator
Handschuh is German for "glove."	A glove is a *shoe* for the *hand.*
Quito is the capital of Ecuador.	*Mosquitoes* are at the *equator.*
Au is the symbol for gold.	*Ay, you* stole my *gold* watch!
The *humerus* bone is the large arm bone above the elbow.	The *humorous* bone is just above the *funny* bone.

KEYWORD METHOD

Like verbal mediation, the **keyword method** aids memory by making a connection between two things. It is especially helpful when there's no logical verbal mediator to fill the gap. It involves two steps, which we can illustrate using the Spanish word *amor* and its English meaning, "love":

1. Identify a concrete object to represent each piece of information. The object can be either a commonly used symbol (e.g., a heart to symbolize *love*) or a sound-alike word (e.g., a suit of armor to represent *amor*). Such objects are *keywords.*
2. Form a mental picture—that is, a visual image—of the two objects together. To remember that *amor* means *love,* we might picture a knight in a suit of armor with a big red heart painted on his chest.



You used the keyword method when you learned the meanings of *fáng, mén, kè, fàn,* and *shū* in the "Five Chinese Words" exercise earlier in the chapter. Here are two more examples:

Information to Be Learned	Visual Image
Augusta is the capital of Maine.	Picture *a gust of* wind blowing through a horse's *mane*.
Tchaikovsky composed the ballet *Swan Lake.*	Picture a *swan* swimming on a *lake*, wearing a *tie* and *cough*ing.

SUPERIMPOSED MEANINGFUL STRUCTURE

A larger body of information, such as a list of items, can often be learned by superimposing a meaningful visual or verbal organizational structure on it—for instance, a familiar shape, word, sentence, rhythm, poem, or story. Following are examples of such **superimposed meaningful structures**:

Information to Be Learned	Superimposed Meaningful Structure
The five Great Lakes of North America (Huron, Ontario, Michigan, Erie, Superior)	HOMES
The number of days in each month	Thirty days have September, April, June, and November. All the rest . . . .
The correct sequence of the 26 letters in the English alphabet	The alphabet song, sung to the tune of "Twinkle, Twinkle, Little Star"

Superimposed meaningful structures can be used to remember procedures as well as declarative information. Here are two examples:

Procedure to Be Learned	Superimposed Meaningful Structure
Shooting a free throw in basketball	BEEF: Balance the ball, Elbows in, Elevate the arms, Follow through.
Simplifying a complex algebraic expression	Please Excuse My Dear Aunt Sally: First simplify terms within **p**arentheses, then terms with an **e**xponent, then terms to be **m**ultiplied or **d**ivided, and finally terms to be **a**dded or **s**ubtracted.

THE LOCI METHOD

Large bodies of information also can be learned by picturing various items or words at different places along a familiar route. When the items need to be recalled, a student can take a mental journey along the familiar route and retrieve the items. The students learn to associate the items (which, in and of themselves, may be unrelated to any prior knowledge) with familiar locations, facilitating memorization.

Information to Be Learned	Placement at Familiar Locations
A multiplication table	To remember the 7-times table (from 1 × 7 up to 12 × 7), imagine the walk from your house to school. Place the answer to each in order, following landmarks passed everyday on the walk (e.g., picture "7" at the front door, "14" at the end of the driveway, "21" at your next door neighbor's house, etc.).
The planets in our solar system	Picture the name of each planet, moving outward from the sun, along a route that you often travel in the car (e.g., the drive from your house to the supermarket), placing the name of planets in order at various locations on the route.

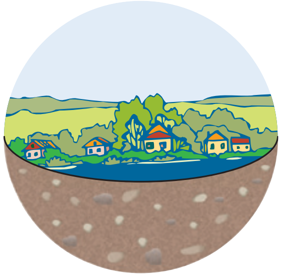
Figure 7.9 Common student beliefs and misconceptions.

In Biology

- Plants use their roots to take in "food" (e.g., water, nutrients) from the soil. (If we take biologists' perspective of what food is, plants produce their own food through photosynthesis.)
- Human vision involves something moving outward from the eye toward the object being seen. (In reality, the opposite is true: Light rays bounce off the object and travel to the eye.)

In Astronomy

- The sun revolves around the Earth. It "rises" in the morning and "sets" in the evening, at which point it "goes" to the other side of the Earth.
- The Earth is shaped like a round, flat disk, with people living on its top, *or* it is a hollowed-out sphere, with people living on a horizontal surface in its middle.
- Space has an absolute "up" and "down"; people who stand at the South Pole will fall into space.



In Meteorology

- The four seasons are the result of the Earth's distance from the sun; the Earth is closer to the sun in the summer, farther away in the winter. (In fact, distance from the sun is largely irrelevant; seasons are the result of the angles at which the sun's rays hit different parts of the Earth's surface.)

In Physics

- Any moving object has a force acting on it. For example, a ball thrown in the air continues to be pushed upward by the force of the throw until it begins its descent. (In reality, force is needed only to change the direction or speed of an object; otherwise, *inertia* is at work.)
- If an astronaut were to open the hatch while traveling in outer space, they would be "sucked out" by the vacuum in space. (In reality, the astronaut would be blown out by the air inside the spacecraft.)

In Mathematics

- Multiplication always leads to a bigger number. (This principle holds true only when the multiplier is larger than 1.)
- Division always leads to a smaller number. (This principle holds true only when the divisor is larger than 1.)
- Parallelograms must be slanted; rectangles must have widths different from their lengths. (In reality, parallelograms can have right angles, in which case they're also rectangles; rectangles can have four equal sides, in which case they're also squares.)

In Geography, History, and Social Studies

- The lines separating countries or states are marked on the Earth's surface.
- Early human beings lived at the same time that dinosaurs did.
- The Buddha was fat.
- Vikings wore horned helmets.

SOURCES: Brewer, 2008; Brophy et al., 2009; Chi, 2008; De Corte et al., 1996; Delval, 1994; diSessa, 1996; Gardner et al., 1996; Haskell, 2001; Hynd, 2003; Lee, 2010; Liben & Myers, 2007; Loria, 2014; Linn & Eylon, 2011; Mason et al., 2017; Masters et al., 2010; Sneider & Pulos, 1983; Staufenberg, 2021; Tirosh & Graeber, 1990; Vosniadou & Brewer, 1987; Vosniadou et al., 2008; Winer et al., 2002.

scientific research. And in history, students' understandings of certain events might be inconsistent with existing historical records and artifacts from the time period in question. Figure 7.9 presents misconceptions that researchers have often observed in students—not only in children and adolescents, but occasionally in college students as well.

Existing misconceptions can sometimes wreak havoc on new learning. As a result of elaborating on new information—a process that usually facilitates learning—students may interpret or distort the information to be consistent with what they already "know" and thus continue to believe what they've always believed. For example, one eleventh-grade physics class was studying the idea that an object's mass and weight do *not*, by themselves, affect the speed at which the object falls. Students were asked to build egg containers that would keep eggs from breaking when dropped from a third-floor

If you took the pretest in Chapter 1, you may have discovered some of your own misconceptions about human learning and development.

window. They were told that on the day of the egg drop, they would record the time it took for the eggs to reach the ground. Convinced that heavier objects fall faster, a student named Barry added several nails to his egg's container. Yet when he dropped it, classmates timed its fall at 1.49 seconds—a time very similar to that for other students' lighter containers. Rather than acknowledge that light and heavy objects fall at the same rate, Barry explained the result by rationalizing that "the people weren't timing real good" (Hynd, 1998a, p. 34).

When students have misunderstandings such as Barry's, teachers must work hard to promote **conceptual change**, a process of revising or overhauling an existing theory or belief system in such a way that new, discrepant information can be better understood and explained. Don't let the term *conceptual* mislead you here: For the most part, we're talking about changing tightly interconnected sets of ideas rather than changing single, isolated concepts.

Obstacles to Conceptual Change

Some misconceptions are easily corrected. Yet students of all ages can hold quite stubbornly to certain counterproductive beliefs about the world, even after considerable instruction that explicitly contradicts those beliefs. Researchers have offered several possible explanations about why students' misconceptions can be so resistant to change.

- *Students' existing beliefs affect their interpretations of new information.* Thanks to the process of meaningful learning—a process that usually facilitates learning—learners are more likely to interpret new information in ways that are consistent with what they already "know" about the world. For example, after one 4-year-old dinosaur enthusiast read a book about how increasingly cold temperatures may have contributed to the dinosaurs' extinction, he speculated that "they did not know how to put on their sweaters" (Linn & Eylon, 2011, p. 1). Presumably he eventually rejected his "sweater" hypothesis, but in many cases, people continue to believe some or all of what they've always believed despite convincing evidence to the contrary (Andiliou et al., 2012; Chan et al., 2017; Kendeou & van den Broek, 2005).

  Furthermore, people of all ages (even college students!) tend to actively *look* for information that confirms their existing beliefs and to ignore or discredit contradictory evidence—a phenomenon called **confirmation bias** (Chinn & Buckland, 2012; Hynd, 1998b; Murphy & Mason, 2006). For example, when students in a high school science lab observe results that contradict what they expected to happen, they might complain, "Our equipment isn't working right," or "I can never do science right anyway" (Minstrell & Stimpson, 1996, p. 192).
- *Students' existing beliefs may be more consistent with their everyday experiences.* Well-established scientific theories are often fairly abstract and sometimes seem to contradict everyday reality (Clark, 2006; Linn, 2008; Wiser & Smith, 2008). For example, in physics, although the law of inertia tells us that force is needed to *start* an object in motion but not to *keep* it in motion, we know from experience that if we want to move a heavy object across the floor, we must continue to push it until we get it where we want it (Driver et al., 1994). And although virtually any piece of matter has some weight, a very small piece of Styrofoam may feel weightless in our hands (Smith, 2007).

You can find more information about people's worldviews in Chapter 4.

- *Some beliefs are integrated into a cohesive whole, with many interconnections among ideas.* In such circumstances, changing misconceptions involves changing a tightly organized set of understandings—perhaps a personally constructed theory or perhaps an entire *worldview*—rather than a single belief (Lewandowsky & Oberauer, 2016; Murphy & Mason, 2006; Rosengren et al., 2012). For example, the belief that the sun revolves around the Earth, rather than vice versa, may be part of a more general Earth-centered view of things that includes the moon, stars, and other heavenly bodies revolving around the Earth as well. In reality, of course, the moon revolves around the Earth, the Earth revolves around the sun, and other stars aren't directly involved with the Earth in one way or another. Yet the Earth-centered view is a much easier one to understand and accept—on the surface, at least—and everything seems to fit so nicely together.

- *Students may fail to notice an inconsistency between new information and their existing beliefs*. Sometimes this happens because students learn the new information in a rote manner, without relating it to things they already know and believe. In other instances, it occurs because existing misconceptions take the form of *implicit knowledge*—knowledge that students aren't consciously aware of. In either circumstance, students don't realize that the material they're studying contradicts their current understandings, and thus they may continue to apply their misconceptions when interpreting new situations (Fernbach et al., 2013; Murphy, 2007; Sinatra et al., 2014; Strike & Posner, 1992).
- *Students may have a personal or emotional investment in their existing beliefs.* For one reason or another, students may be especially committed to certain beliefs, to the point that they will stubbornly defend those beliefs even in the face of overwhelming arguments and evidence to the contrary. In some instances, their beliefs may be an integral part of their lifestyle, culture, or religion. In other cases, students may interpret challenges to their beliefs as threats to their self-esteem or general sense of well-being. In either situation, students may cling to their current understandings even more tightly than they had before encountering more valid and productive explanations (Hertwig & Engel, 2016; Kunda, 1990; Lewandowsky & Oberauer, 2016; Sinatra et al., 2014).

Promoting Conceptual Change

For the reasons just identified, promoting conceptual change can be quite a challenge. Not only must we help students learn new things, but we must also help them *un*learn—or at least *inhibit*—their existing beliefs. Following are strategies that seem to have an impact, especially when used in combination.

- *Identify existing misconceptions before instruction begins.* We can more easily address students' misconceptions when we know what they *are* (Murphy & Alexander, 2008). Thus, we should probably begin any new topic by assessing students' current beliefs about the topic—perhaps simply by asking a few informal questions and probing further if students' initial explanations are vague. As an example, an 11-year-old once described rain as "water that falls out of a cloud when the clouds evaporate." The response had an element of truth—evaporation is an essential process in cloud formation—but wasn't quite on target: Rain actually results a bit later in the water cycle as a result of *condensation*. A series of follow-up questions eventually revealed a rather unique understanding: The water "comes down at little times like a saltshaker when you turn it upside down. It doesn't all come down at once 'cause there's little holes [in the cloud] and it just comes out" (Stepans, 1991, p. 94). This conception of a cloud as a saltshaker is hardly consistent with scientific views of rain and should definitely be addressed during instruction.

  Informal preassessments of students' current understandings will be especially important in your first few years of teaching. As you gain experience teaching a particular topic year after year, you may eventually find that you can anticipate what students' prior beliefs and misbeliefs about the topic are likely to be.
- *Look for and then build on kernels of truth in students' current understandings*. Often, students' current understandings have a partly-right-and-partly-wrong quality (diSessa, 1996, 2006; Vosniadou, 2008). For example, the 11-year-old with the saltshaker explanation of rain correctly knew that evaporation is somehow involved in the water cycle, and such knowledge would be a good starting point for further instruction. Among other things, a teacher might (1) help the child understand how evaporation and condensation are

essentially opposite processes that involve either changing from liquid form to vapor form (evaporation) or vice versa (condensation); and (2) explain how a cloud actually is *water itself* rather than a saltshaker-like water container.

- *Convince students that their existing beliefs need revision.* We can more effectively promote conceptual change when we help students discover why their existing conceptions are inadequate. In Jean Piaget's terminology, we need to create *disequilibrium*, perhaps with strategies such as these:
    - Present phenomena and ask questions that lead students to find weaknesses in their current understandings.
    - Have students conduct experiments to test various hypotheses and predictions.
    - Ask students to propose several possible explanations for puzzling phenomena and to discuss the pros and cons of each one.
    - Show how one explanation of an event or phenomenon is more plausible (i.e., makes more sense) than others.
    - Have students apply the new ideas to real-life situations and problems.
    - Have students read two or more written documents or internet posts that present conflicting information; ask them to analyze and contrast these sources with respect to the quality of the arguments and evidence provided (Beardsley et al., 2012; Chinn & Samarapungavan, 2009; Clark, 2006; Lewandowsky et al., 2012; Linn & Eylon, 2011; Lombardi et al., 2016; Murphy & Mason, 2006; Pine & Messer, 2000; Richter & Maier, 2017; Thacker et al., 2020; Van Loon et al., 2015; Vosniadou, 2008).

    Such strategies might encompass a wide variety of instructional methods, including demonstrations, hands-on activities, teacher explanations, small-group or whole-class discussions, and writing assignments. Older students who are proficient readers may revise their beliefs after reading *refutation texts*. Refutation texts are readings that identify a common misperception, refute the misperception with evidence, and explain the new evidence in an easy-to-understand manner (Aguilar et al., 2019; Prinz et al., 2019; Sinatra & Broughton, 2011; Thacker et al., 2020; Weingartner & Masnick, 2019). All of these strategies have one thing in common: a focus on meaningful learning rather than rote memorization.
- *Motivate students to learn correct explanations.* Students will be most likely to engage in meaningful learning and to undergo conceptual change when they're motivated to do so. At a minimum, they must be interested in the subject, see it as useful in helping them achieve their personal goals, set their sights on mastering it, and have sufficient self-confidence to believe they *can* master it. Furthermore, the classroom should be socially and emotionally *supportive* of conceptual change. For example, students must feel confident that (1) their teacher and classmates won't ridicule them for their initially erroneous or partly-right-but-partly-wrong ideas and (2) the ultimate goal of a lesson is understanding the subject matter rather than simply performing well on a quiz or assignment (Hatano & Inagaki, 2003; Pintrich et al., 1993; Sinatra & Mason, 2008).

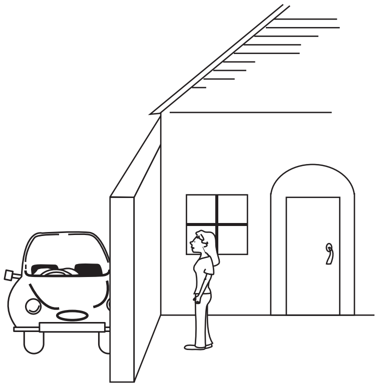
Chapters 10 and 11 describe many strategies for motivating students to master academic content.

- *Monitor what students say and write for signs of persistent misconceptions.*Some misconceptions and only-partly-correct understandings may persist despite our best efforts. Throughout a lesson, then, we should check students' beliefs about the topic at hand, looking for subtle signs that their understanding isn't completely on target and giving corrective feedback when necessary. As an illustration, imagine a lesson about human vision that includes the following general principles:
    - The retina of the human eye detects light rays that reach it; the eye sends information about these light rays to the brain for interpretation.
    - A person sees an object when light rays (1) travel from the sun or other light source to the object, (2) bounce off the object, and then (3) travel to the retina.
    - Light rays bounce off some (opaque) objects but go through other (transparent) objects.

As previously noted in Figure 7.9, a common misconception is that vision involves something going *from* the eye *to* the object. This misconception is something we would want to be on the lookout for throughout the lesson. For instance, we might show students the drawing in Figure 7.10 and ask them whether the girl can see the car. Several of them might respond, "No, she can't see through it" or "It's opaque." The phrase "see through" is one that people often use when talking about transparent objects, but it implies that something is traveling from—not *to*—the eye. We would thus want to ask follow-up questions to pin down their reasoning: "What do you mean, she can't see *through* it?" "What does *opaque* mean?" and "What are the light rays doing?"

Assessment of students' comprehension is important *after* a lesson as well. We're more likely to detect and correct misconceptions when we ask students to *explain* and *apply* what they've learned, rather than just asking them to spit back memorized facts, definitions, and formulas (Clark, 2006; Pine & Messer, 2000; Roth, 1990). Even so, we must remember that true and lasting conceptual change may take considerable time and instruction, especially if it involves overhauling a complex, interrelated set of student-constructed ideas (McClelland, 2013; Vosniadou, 2008).

Figure 7.10 Can the girl see the car? If not, why not?



Remember that true and lasting conceptual change about complex phenomena can take considerable time and instruction—ideally, spread out over several years and grade levels.

Long-Term Memory Retrieval

Learning Objective 7.5 **Describe several factors that influence students' ability to recall what they have previously learned; also, describe several reasons why students may either forget or incorrectly remember what they have learned.**

Students learn tremendous amounts of information in school. As teachers we certainly hope that they remember what we have taught them. But how much do they actually remember?

Experiencing Firsthand

The following quiz covers factual information that many students learn about between grades 1 through 12. Answer each one as best as you can, without looking up any of the answers.

(1) Who wrote, "I Know Why the Caged Bird Sings"?
(2) Which U.S. president served the longest term?
(3) What does a rhombus look like?
(4) Would you weigh more, less, or the same as your current weight if you were on Mars?
(5) How many planets are there in the solar system?

We'll look at the answers in a moment. First, think about how easy or difficult it was for you to answer these questions. Did you struggle with any? Did any of the questions make you think, "I know that, but I just can't remember the answer"?

Here are the correct answers: (1) Maya Angelou, (2) Franklin D. Roosevelt, (3) A rhombus has four sides, with opposite sides parallel, and all sides of the same length, (4) You'd weigh less, and (5) Many scientists agree that there are eight planets, but there is still some debate about Pluto, so some might say nine.

You probably were able to answer a few of the questions, but you also probably were not immediately able to answer all of them without any hints or prompts. In addition, you might argue that question #5 isn't fair, because there could be two answers.

This exercise probably demonstrated to you that retrieving information from long-term memory isn't always straightforward. Retrieval of information appears to involve following a pathway of associations; it's a process of mentally going down Memory Lane. One idea reminds us of another idea—that is, one idea *activates* another—the second idea reminds us of a third idea, and so on. The process is similar to what happened when you followed your train of thought from the word *horse* earlier in the chapter. If the pathway of associations eventually leads us to what we're trying to remember, we do indeed remember it. If the path takes us in another direction, we're out of luck.

Thus, we're more likely to remember something later on if, in the process of storing it, we connect it with one or more things already in our long-term memory. By making connections to existing knowledge—that is, by engaging in meaningful learning—we'll have some idea about how to "find" the information when we need it. Otherwise, we may never retrieve it again. For example, someone who is preparing to become a social studies teacher may have easily been able to answer the question about the presidents, whereas someone preparing to be a language arts teacher may have easily recalled Maya Angelou is the author of "I Know Why the Caged Bird Sings." However, someone who has no interest in science, and has not thought much about science since high school, may have had trouble answering the question about weight on Mars.

Factors Affecting Retrieval

Even when people connect new information to their existing knowledge, they can't always remember it when they need to. Several factors influence the likelihood of successfully retrieving something from long-term memory.

Multiple Connections with Existing Knowledge and a Variety of Contexts Sometimes learners acquire and practice certain behaviors and ways of thinking in a very limited set of environments—say, in their science or civics classes. When this happens, students may associate those behaviors and ways of thinking *only* with those particular environments and thus fail to retrieve what they've learned when they're in other contexts (Day & Goldstone, 2012; Gresalfi & Lester, 2009; Kirsh, 2009). This tendency for some responses and cognitive processes to be associated with and retrieved in some contexts but not in others is often called **situated learning** or **situated cognition**. For example, if students associate principles of geometry only with math classes, they may not retrieve those principles at times when geometry would come in handy—say, when trying to determine whether a 10-inch pizza that costs $8.00 is a better value than an 8-inch pizza that costs $6.00.

In general, learners are more likely to retrieve information when they have *many* possible pathways to it—in other words, when they have associated the information with many other things they know and with many different contexts in which they might use it. For instance, we might show students how topics relate to some or all of the following:

- Concepts and ideas within the same subject area (e.g., showing how multiplication is related to addition)
- Concepts and ideas in other subject areas, perhaps through **interdisciplinary instruction** that integrates two or more academic domains (e.g., talking about how various scientific discoveries have played important roles in historical events)
- Students' general knowledge of the world (e.g., relating the concept of *inertia* to how passengers are affected when a car quickly turns a sharp corner)
- Students' personal experiences (e.g., finding similarities between the family feud in *Romeo and Juliet* and students' own interpersonal conflicts)
- Students' current activities and needs outside the classroom (e.g., showing how persuasive writing skills might be used to craft an essay for a college application)

Help students connect important ideas to a variety of disciplines and real-world situations.

Distinctiveness Learners are more likely to remember things that are unique in some way—for instance, things that are new, unusual, or a bit bizarre (R. R. Hunt & Worthen, 2006). For example, second graders are more likely to remember a visit to the local firehouse than, say, their teacher's explanation of what an *adverb* is. And when U.S. high school students recall what they've learned about events leading up to the American Revolution, they're more likely to remember the Boston Tea Party—a unique and colorful illustration of colonists' dissatisfaction with British taxation policies—than, say, the Quartering Act or the publication of Thomas Paine's *Common Sense*. Learners are more likely to *pay attention* to distinctive information, increasing the odds that they store it in long-term memory in the first place. But even when attention and initial learning have been the same, distinctive information is easier to retrieve than dull-and-ordinary information (Craik, 2006; Mather & Sutherland, 2011).

Make important ideas distinctive in some way, perhaps by illustrating them with vivid examples or engaging hands-on experiences.

Emotional Overtones As learners pay attention to and think about new information, their thoughts and memories sometimes become emotionally charged—a phenomenon called **hot cognition**. For example, learners might get excited when they read about advances in science that could lead to effective treatments for cancer, spinal cord injuries, or mental illness. Or they might feel sadness and compassion when they read about severely impoverished living conditions in certain parts of the world. And they will, we hope, get angry when they learn about atrocities committed against African American slaves in the pre–Civil War days of the United States or about large-scale genocides carried out in more recent times in Europe, Africa, and Asia.

When information is emotionally charged, learners are more likely to pay attention to it, continue to think about it for an extended period, and repeatedly elaborate on it (Bower, 1994; Heuer & Reisberg, 1992; Manns & Bass, 2016). And over the long run, learners can usually retrieve material with high emotional content more easily than they can recall relatively nonemotional information (LaBar & Phelps, 1998; Phelps & Sharot, 2008; Reisberg & Heuer, 1992). Students' emotional reactions to topics become integral parts of their network of associations in long-term memory (Barrett, 2017; Immordino-Yang & Gotlieb, 2017).

Academic subject matter certainly doesn't need to be dry and emotionless. In addition to presenting lessons that evoke students' emotions, we can promote hot cognition by revealing our own feelings about a topic. For instance, we might bring in newspaper articles and other outside materials about which we're excited, or we might share the particular questions and issues about which we ourselves are concerned (Brophy, 2004; Perry, 1985).

Convey your own enthusiasm for a topic.

Regular Practice and Review As noted earlier, rehearsal—mindlessly repeating information over and over within the course of a few seconds or minutes—is a relatively *in*effective way of getting information into long-term memory. But by "regular practice" here, we mean repetition over a *lengthy* time span: reviewing and using information and skills at periodic intervals over the course of a few weeks, months, or years. When practice is spread out in this manner—ideally in a variety of contexts—people of all ages learn something better and remember it longer (Lindsey et al., 2014; Rohrer & Pashler, 2010; Sodorstrom & Bjork, 2015). When students are given very brief assessments regularly so that they can practice retrieving recently learned information, they are likely to be able to recall that content more efficiently when they have a larger, end-of-unit test (Brame & Biel, 2015). And once students are able to engage in higher order thinking (e.g., when they are in middle school), asking them to engage in higher order thinking about newly learned material can also help them with later retrieval of that information (Agarwal, 2019). This type of practice benefits students of all ability levels (Jonsson et al., 2021).

When learners continue to practice things they've already mastered, they eventually achieve **automaticity**: They can retrieve what they've learned quickly and effortlessly and can use it almost without thinking (Anderson, 2005; Pashler et al., 2007; Proctor & Dutta, 1995). The exercise on the next page will almost certainly illustrate your automaticity for one of your most basic skills.

Occasionally, conduct activities in which students review and practice things they've learned in previous weeks, months, or years.

The correct answers are "red," "purple," "pink," and "green," in that order. Many skilled readers have trouble with this task because those particular letter combinations automatically evoke *different* responses: "blue," "green," "yellow," and "orange" (e.g.,

Experiencing Firsthand

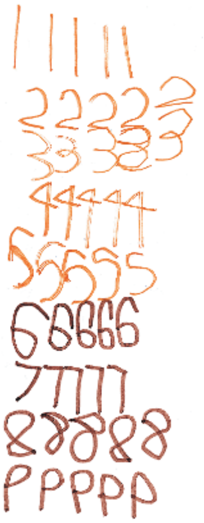
Naming Colors

Following are four common words. As quickly as you can, name the *color of the letters* that spell out each word.

blue
green
yellow
orange

Cohen et al., 1990; Stroop, 1935). Most young children—those who haven't yet acquired automaticity for basic word recognition—have a much easier time answering correctly.

Figure 7.11 Occasional rote practice of numerals and letters can be helpful in promoting automaticity, but too much conveys the message that learning basic skills is boring and tedious. Here, 5-year-old Gunnar has practiced writing numerals 1 through 9. Notice that he got practice in writing 9 *backward*!



Belcher, Patricia

In general, automaticity for basic knowledge and skills is an advantage rather than a liability, in that learners can easily retrieve knowledge they frequently need. Learning some things to a level of automaticity has a second advantage as well. Remember that working memory has a limited capacity: The active, consciously thinking part of the human memory system can handle only so much at a time. When much of its capacity must be used for recalling isolated facts or carrying out simple procedures, little room is left for addressing more complex situations, problems, or tasks. One key reason for learning some facts and procedures to the point of automaticity, then, is to free up working memory capacity for complex tasks and problems that require those simpler facts and procedures (De La Paz & McCutchen, 2011; Fuchs et al., 2013; Kalyuga, 2010). For example, second graders who are reading a story can better focus their efforts on understanding it if they don't have to sound out words like *before* and *after.* High school chemistry students can more easily interpret the expression Na_2CO_3 (sodium carbonate) if they don't have to stop to think about what the symbols *Na, C,* and *O* represent.

Unfortunately, automaticity is achieved in only one way: practice, practice, and more practice. Practice doesn't necessarily make perfect, but it does make knowledge more durable and more easily retrievable. When learners use information and skills frequently, they essentially pave their retrieval pathways—in some cases creating superhighways. This is *not* to say that we should continually assign drill-and-practice exercises involving isolated facts and procedures (e.g., see Figure 7.11). Such activities promote rote (rather than meaningful) learning, are often boring, and are unlikely to convince students of the value of the subject matter (Mac Iver et al., 1995). A more effective approach is to routinely incorporate basic knowledge and skills into a variety of meaningful and enjoyable activities, such as problem-solving tasks, brainteasers, group projects, and games.

Relevant Retrieval Cues If you were educated in North America, then at one time or another you probably learned the names of the five Great Lakes. Yet, at any given moment, you might have trouble retrieving all five, even though they're all still stored somewhere in your long-term memory. Perhaps Lake Michigan doesn't come to mind when you recall the other four. The *HOMES* mnemonic presented in Figure 7.8 provides a **retrieval cue**—a hint about where to "look" in long-term memory. The mnemonic tells you that one lake begins with the letter *M,* prompting you to search among the *M* words you know until you find *Michigan.* Learners are more likely to retrieve information when relevant retrieval cues are present to start their search of long-term memory in the right direction (e.g., Morris et al., 1977; Tulving & Thomson, 1973).

In the five-question quiz that you took at the beginning of this section, do you think it would have been easier to answer the questions if they had been given in a multiple-choice format, rather than asking you to retrieve the answers from your long- term memory without any cues? For example, consider the question, “Which U.S. president served the longest term?” If the question had been written as follows, would it have been easier to answer”

> *Which U.S. president served the longest term? (a) George Washington (b) Abraham Lincoln (c) Franklin D. Roosevelt, (d) Ronald Reagan*

Most students find the multiple-choice format to be easier to respond to than the open-ended format in which no response options are provided. The choices provide retrieval cues that can help learners to access information from long-term memory. Providing retrieval cues is often useful in the classroom, especially when students have trouble recalling information that might help them remember or apply *other* information. An example comes from Jess Jensen, a former teacher intern of one of the authors. A student in her eighth-grade history class had been writing about the Battle of New Orleans, which was a decisive victory for the United States in the War of 1812. The following exchange took place:

Student: Why was the Battle of New Orleans important?

Jess: Look at the map. Where is New Orleans?

[The student finds New Orleans.]

Jess: Why is it important?

Student: Oh! It’s near the mouth of the Mississippi. It was important for controlling transportation up and down the river.

In the early grades, teachers typically provide many retrieval cues for their students; for instance, they remind students about tasks they need to do at certain times (“I hear the fire alarm. Remember, we must all walk quietly during a fire drill”). But as students grow older, they must develop greater independence, relying more on themselves and less on their teachers for the things they need to remember. At all grade levels we can teach students ways of providing retrieval cues for *themselves*. For example, if we expect first graders to get a permission slip signed, we might ask them to write a reminder on a piece of masking tape that they put on their jacket or backpack. If we give junior high school students a major assignment due in several weeks, we might suggest that they tape a note with the due date to their bedside table or add one or more reminders to their cell phone calendar. One tenth grader developed several effective retrieval cues, each appropriate for certain situations:

> Homework is written down in my agenda book. If it is something to do when I get home, I will write it on my hand. If I have something to do in the next few days, I write it on a note card in my wallet, and whenever I go to get money, I will think to do it.

Provide retrieval cues when appropriate. Also, teach students to develop their own retrieval cues for things they must remember to do.

Wait Time **Wait time** is the length of time a teacher allows to pass after they or a student say something before the teacher says something else. It’s often unreasonable to expect students to formulate insightful, creative responses in a split second. When teachers allow several seconds of quiet wait time either after they have asked a question or a student has made a statement, more students participate in class—this is especially true for females and ethnically diverse students. Moreover, students are more likely to comment on their classmates’ answers and opinions when sufficient wait time is provided. In addition, students are more likely to support their reasoning with evidence or logic and more likely to speculate when they don’t know an answer (Moon, 2008; Rowe, 1974; Tobin, 1987).

When our objective is simple recall—when students need to retrieve material very quickly, to “know it cold”—then wait time should be short. Students may sometimes benefit from rapid-fire drill and practice to learn information and skills to automaticity. But when our instructional goals include more complex processing of ideas and issues, a longer wait time may give both our students and us the time everyone needs to think things through.

Give students time to think about and formulate responses to challenging questions.

Why Learners Sometimes Forget

Fortunately, people don't need to remember everything they've stored. For example, you may have no reason to remember the internet address of a website you looked at yesterday, the plot of last week's episode of a certain television show, or the due date of an assignment you turned in last semester. Much of the information learners encounter is, like junk mail, not worth keeping, and forgetting it enables learners to get rid of needless clutter. But sometimes learners have trouble recalling what they *do* need to remember. Here, we look at several possible explanations for why students may sometimes forget important information.

Failure to Store or Consolidate Information in Long-Term Memory As we've seen, a great deal of the information students encounter never reaches long-term memory. Perhaps students didn't pay attention in the first place, so the information never went beyond the sensory register. Or perhaps after attending to it, students didn't continue to process it, so it went no further than working memory.

Even when information does reach long-term memory, it needs some time to "firm up" in the brain—a process called **consolidation** (Rasch & Born, 2008; Wixted, 2005). A good night's sleep after learning something new seems to facilitate this process (see the earlier Applying Brain Research feature). Thus, the common practice of "pulling an all-nighter"—studying until the wee hours of the night to prepare for an exam the following morning—is unlikely to be productive (Scalise & Felde, 2017). And a more traumatic event that interferes with consolidation—such as a serious brain injury—may cause someone to forget things that happened several seconds, minutes, hours, or even longer prior to the event (Bauer et al., 2007; Wixted, 2005).

Regularly discourage students from studying late at night at the expense of getting a good night's sleep.

Decay Historically, many psychologists believed that once information is stored in long-term memory, it remains there permanently in some form (Loftus & Loftus, 1980). More recently, however, some psychologists have come to the conclusion that information can slowly weaken and eventually disappear—that is, it can **decay**—especially if it isn't used regularly (Altmann & Gray, 2002; Sadeh et al., 2016; Schacter, 1999).

Unsuccessful Search of Long-Term Memory A man at the supermarket looks familiar, but you can't remember who he is or where you met him. He smiles at you and says, "Nice to see you again." Gulp! You desperately search your long-term memory, but you've clearly forgotten why you know this man. A few days later, you have a bowl of chili for dinner. The chili reminds you of the Chili for Charity supper at which you worked a few months back. Of course! You and the man at the supermarket had stood side by side serving chili to hundreds of people that night.

Like you, students often have retrieval difficulties: They simply can't find something that's actually in long-term memory (e.g., Schacter, 1999). Sometimes they may stumble on the information later, while looking for something else. But at other times they never do retrieve it, perhaps because they've learned it by rote or don't have sufficient retrieval cues to guide their memory search.

Interference Sometimes people can easily retrieve things they've learned but don't know what goes with what. To experience this phenomenon yourself, the exercise on the next page.

Did you find yourself getting confused, perhaps forgetting which English meaning went with each Chinese word? If you did, you were the victim of **interference**. The various pieces of information you stored in memory were interfering with one another—essentially, they were getting mixed up in your head. Interference is especially likely to occur when items are similar to one another and when they're learned in a rote rather than meaningful or mnemonic-based fashion (Lustig et al., 2004; Sadeh et al., 2016).

Reconstruction Error Have you and a friend ever remembered the same event quite differently, even though the two of you were equally active participants at the time? Were

Experiencing Firsthand

Six Chinese Words

Following are six more Mandarin Chinese words and their English meanings (for simplicity's sake, we've omitted the tone marks over the words). Read the words two or three times and try to store them in your long-term memory. But don't do anything special to learn the words—for instance, don't intentionally develop mnemonics to help you remember them.

Chinese	English
jung	middle
ting	listen
sung	deliver
peng	friend
ching	please
deng	wait

Now cover up the list of words and test yourself. What is the Chinese word for *friend?* For *please?* For *listen?* For *wait?*

you and your friend both certain of the accuracy of your own memories and convinced that the other person remembered incorrectly? Constructive processes in retrieval might explain this difference of opinion. Retrieval isn't necessarily an all-or-nothing phenomenon. Sometimes learners retrieve part of the information they're seeking but can't recall the rest. They may logically but incorrectly fill in the gaps using their general knowledge and assumptions about the world. This form of forgetting—which might be better called *misremembering*—is known as **reconstruction error** (Levstik, 2011; Roediger & McDermott, 2000; Schacter, 1999).

When important details are difficult to fill in logically or might easily be confused with one another, make sure students learn them well.

Recalling an event we've previously experienced often affects our later memory for the event, especially if we verbally describe the event and perhaps embellish on it in some way (Karpicke, 2012; Marsh, 2007; Seligman et al., 2013). Neurologically speaking, by recalling the event, we're also revising and *reconsolidating* it in the brain—that is, we're firming it up anew—with a mixture of information we actually received and our elaborations of it (Schacter, 2012; Treanor et al., 2017).

All of these explanations of forgetting underscore the importance of instructional strategies presented earlier: We must make sure students are paying attention, help them relate new material to things they already know, and give them frequent opportunities to review, practice, and apply the material.

Diversity in Cognitive Processes

Learning Objective 7.6 Give examples of the diversity in cognitive processes you are likely to see in students, in some cases as a result of students' cultural backgrounds or special educational needs.

Children and adolescents differ considerably in the various factors that influence their ability to learn and remember in the classroom, including their attention spans, working memory capacity, executive functioning, long-term memory storage processes, and prior knowledge. For example, students with a relatively small working memory capacity and poorly developed executive functioning are apt to have trouble remembering instructions, tackling complex tasks, and keeping their minds on a task at hand—all of which adversely affect their academic achievement levels (Alloway et al., 2009; DeMarie & López, 2014; Miyake & Friedman, 2012). Working memory and executive functioning difficulties are especially common in children who have grown up in chronically stressful living conditions, often as a result of living in extreme poverty (Evans & Schamberg, 2009; Masten et al., 2012; National Academies of Sciences, Engineering, and Medicine, 2018; Noble et al., 2007). Meanwhile, students who have grown up in multi-language environments and hence are fluent in at least two different languages—that is, students who are *bilingual*—tend to surpass their single-language peers in both working memory capacity and executive functioning, probably because they've had considerable practice in mentally inhibiting their knowledge of one language while speaking or writing in the other (Bialystok et al., 2008; Grundy & Timmer, 2017).

Another noteworthy source of diversity in cognitive processing is cultural background. Different cultures foster somewhat different ways of looking at physical and social events—different worldviews—that influence how students interpret classroom subject matter. For example, students whose cultures have taught them to strive to live in harmony with their natural environment may struggle with a science curriculum that urges them to *change* their environment in some way (Atran et al., 2005; Medin, 2005). And whereas students of European ancestry are apt to view the Europeans' migration to North America in the 1600s and 1700s as a process of *settlement,* students with Native American backgrounds might instead view it as increasing *invasion* (Banks, 1991; VanSledright & Brophy, 1992).

Expose students to multiple and possibly equally valid perspectives of historical and current events.

Children's varying cultural backgrounds may also have prepared them to handle different kinds of learning environments and tasks. Outside of school, students' diverse cultural backgrounds expose them to vastly different experiences, resulting in variability in certain aspects of their prior knowledge. We need to be keenly aware of this, because, as we have stated throughout this chapter, our students' prior knowledge affects how they learn and remember new content. For instance some Black and Latino/a/x students may be more likely than White students to be comfortable in environments in which several activities are going on at once and can more easily shift their attention from one activity to another (Correa-Chávez et al., 2005; Tyler, Uqdah et al., 2008). Students from North American, East Asian, and Middle Eastern cultures are apt to have had experience rote-memorizing specific facts and written materials (perhaps in the form of multiplication tables, poems, or religious teachings), whereas students from certain cultures in Africa, Australia, and Central America may have been encouraged to remember oral histories or particular landmarks in the local terrain (Chang et al., 2011; Rogoff, 2001, 2003; Rogoff et al., 2007; Wang & Ross, 2007).

The importance of wait time depends partly on students' cultural backgrounds as well. For example, some Native American students may wait several seconds before responding to a question as a way of showing respect for an adult (Castagno & Brayboy, 2008; Gilliland, 1988). And English language learners—students who have grown up in a non–English-speaking environment and are still developing their proficiency in English—are apt to require more mental translation time than their native–English-speaking peers (Igoa, 2007).

Chapter 4 describes cultural differences in wait time.

To maximize each student's learning and achievement, we must take such individual and group differences into account. For example, we should be especially careful to engage the interest of—and also minimize distractions for—those students whose attention easily wanders. In addition, in our attempts to promote meaningful learning and other effective storage processes, we should relate lessons to the diverse background experiences that students have had. And we must also allow sufficient wait time after questions and comments so that all students can actively think about and elaborate on topics of discussion.

Facilitating Cognitive Processing in Students with Special Needs

Some diversity in learning and cognitive processes is the result of certain disabilities on the one hand, or giftedness on the other. For example, some students with disabilities have particular trouble attending to and effectively processing new content.

This is certainly true for students with learning disabilities (who, by definition, have deficits in specific cognitive processes), and it's often true for students with attention-deficit hyperactivity disorder (ADHD) and general intellectual disabilities as well. In contrast, many children with autism spectrum disorders can be *very* attentive, sometimes to the point that they have trouble shifting to new tasks. Table 7.4 identifies commonly observed cognitive processing differences in students who have special educational needs.

STUDENTS IN INCLUSIVE SETTINGS

Table 7.4 Facilitating Cognitive Processing in Students with Special Educational Needs

Category	Characteristics You Might Observe	Suggested Strategies
Students with specific cognitive or academic difficulties	• Deficiencies in one or more specific cognitive processes (e.g., perception, organization of related ideas into an integrated whole) • Distractibility, inability to sustain attention for some students • Less working memory capacity or less efficient use of working memory • Difficulty remembering multi-step instructions • Exceptionally detailed memory for personally experienced events (for some students with ADHD)	Look at the nature of students' errors to pinpoint specific processing difficulties. Modify instruction and assignments in ways that enable students to compensate for their limitations. Divide complex tasks into several simpler parts and present instructions one step at a time. Intersperse activities requiring sustained attention with opportunities for physical exercise. Encourage greater reflection before responding—for instance, by reinforcing accuracy rather than speed. When appropriate, provide concrete memory aids that remind students of what they've learned. Capitalize on students' strengths (e.g., extensive knowledge about certain topics).
Students with social or behavioral problems	• Limited ability to focus attention because of off-task thoughts and behaviors (for some students with emotional and behavioral disorders) • Difficulty shifting attention quickly (for some students with an autism spectrum disorder) • Exceptional ability to attend to small details; may be reflected in unusually detailed memory and drawings (for some students with an autism spectrum disorder) • Impulsivity; less ability to inhibit inappropriate social behaviors • Possible difficulties in other cognitive processes (e.g., undiagnosed learning disabilities)	Capture students' attention by relating instruction to their personal interests. Capitalize on the visual-memory and artistic strengths that some students with an autism spectrum disorder may have. If appropriate, refer students to a school psychologist for evaluation and diagnosis of possible learning disabilities. As appropriate, use strategies listed previously for students with specific cognitive or academic difficulties.
Students with general delays in cognitive and social functioning	• Slower cognitive processing • Reduced working memory capacity or less efficient use of working memory • Limited executive functioning capabilities (e.g., difficulty with attention to task-relevant information) • Smaller prior knowledge base on which to build new learning • Greater difficulty retaining information for long periods of time	Keep instructional materials simple, emphasizing relevant stimuli and minimizing irrelevant stimuli. Provide clear instructions that focus students' attention on desired behaviors (e.g., "Listen," "Write," "Stop"). Pace instruction to allow students enough time to think about and process information adequately (e.g., provide ample wait time after questions). Assume little or no prior knowledge about new topics.
Students with physical or sensory challenges	• Normal cognitive processing ability in most students • Less-developed knowledge base to which new information can be related, due to limited experiences • Better-than-average ability to recall details of abstract shapes (for older students who are deaf but proficient with sign language)	Assume equal ability for acquiring new information and skills unless you have good reason to do otherwise. Provide assistive technologies that enable students to circumvent sensory or physical challenges. Provide basic life experiences that students may have missed because of their disabilities.
Students with advanced cognitive development	• More rapid cognitive processing • More advanced executive functioning capabilities (e.g., greater ability to attend to tasks for extended periods) • Larger knowledge base, with specific contents dependent on students' cultural backgrounds • More interconnections among ideas in long-term memory; greater conceptual understanding of classroom material	Proceed through topics more quickly or in greater depth. Create interdisciplinary lessons to foster integration of material in long-term memory.

SOURCES: Barkley, 2006; Beirne-Smith et al., 2006; Cattani et al., 2007; Chapman et al., 2012; Clark, 1997; Courchesne et al., 1994; DeMarie & López, 2014; Fletcher et al., 2018; Gathercole et al., 2006; Geary et al., 2012; Grandin & Panek, 2014; Heward, 2009; Johnson et al., 2003; Kaku, 2014; Lyon & Krasnegor, 1996; Meltzer, 2007; Metcalfe et al., 2013; Moran & Gardner, 2006; Posner & Rothbart, 2007; Skowronek et al., 2008; Swanson et al., 1998; Turnbull et al., 2016.

Chapter 5 identifies specific categories of special needs that fall within the five general categories listed in Table 7.4.

As teachers, we must keep in mind that students with disabilities almost invariably have strengths as well as weaknesses. For example, some students with ADHD have a keen memory for events they've personally experienced and may generate more detailed narratives than their classmates without disabilities (Skowronek et al.,2008). Similarly, some students with autism spectrum disorders notice and remember many subtle nuances in the things they see, and may produce highly detailed and skillful drawings that are unusual for their age group (Cohen, 2007; Kaku, 2014; Moran & Gardner, 2006).

The far-right column of Table 7.4 presents useful strategies for working with students who have special educational needs. Virtually all students occasionally have trouble learning or remembering class material. Accordingly, many of the instructional strategies in Table 7.4 need not be limited to use with students with special needs. *All* students can benefit from guidance and support that enable them to process information more effectively.

Chapter 7 What Have You Learned?

In this chapter, we examined various aspects of human learning, focusing in particular on the components of memory, and how those components affect learning in children and adolescents. As a way of summing up the discussion of learning and cognitive processes in this chapter, we now return to the chapter's learning outcomes.

7.1 **Describe five basic assumptions underlying cognitive theories of learning and use these assumptions to help you better understand how people of all ages typically think and learn.** In contrast to behavioral theories of learning, cognitive theories acknowledge that as learners, our memories, perceptions, and reasoning skills affect learning. Specifically, cognitive theories assume that (a) mental processes (i.e., how and what we think) influence what our students are learning; (b) behaviors often provide clues about how our students are learning; (c) our students may or may not attend to the numerous stimuli that they encounter; (d) our students actively construct their own interpretations of the material that they are learning; and (e) over time, students develop more sophisticated cognitive processing abilities.

7.2 **Describe key components that many psychologists believe may characterize the human memory system.** We identified three components of human memory. A *sensory register* provides temporary storage for incoming information, holding new input for two or three seconds at most. By paying attention to information, learners move it to *working memory*, where they actively think about and make sense of it. Attention and working memory have a limited capacity; hence, students can pay attention to and think about only a small amount of information at any one time. Information stored in working memory has a short duration (typically less than half a minute) and so must be processed further to promote storage in *long-term memory.* Long-term memory has an extremely large capacity and an indefinitely long duration. This particular model of memory has its flaws—for example, some brain research indicates that working memory and long-term memory aren't as distinctly divided as the model suggests—but it can help us remember many aspects of learning and memory that we should take into account when planning and delivering instruction.

7.3 **Apply your knowledge of long-term memory storage to identify effective strategies for enhancing students' learning.** Long-term memory contains both information (*declarative knowledge*) and skills (*procedural knowledge*). A good deal of it is organized—often as concepts that are, in turn, integrated into more general schemas, scripts, and personal theories. To effectively acquire the kinds of declarative knowledge a school curriculum encompasses, learners should ideally engage in meaningful learning, perhaps by elaborating on or organizing new information or perhaps by engaging in visual imagery. In some cases, acquiring procedural knowledge involves learning and refining various physical behaviors; in other cases, it involves gradually converting declarative knowledge into either physical or mental actions.

How successfully learners store new information and skills depends, in part, on how much they already know about the topic at hand; good instruction accommodates individual differences in prior knowledge (e.g., via well-designed instructional software programs). In the absence of relevant prior knowledge, mnemonics can enhance learners' memory for things that are important for them to remember.

7.4 **Explain how students' self-constructed beliefs can sometimes interfere with effective learning, and identify several ways of helping students productively revise such beliefs.** Although meaningful learning is usually beneficial, it can occasionally lead students to misinterpret classroom material, especially if they currently have erroneous or only-partially-correct beliefs about the topic or phenomenon they're studying. Some misconceptions may persist despite lessons and activities that present information to the contrary, in part because students are cognitively and emotionally predisposed to confirm (rather than discredit) what they currently believe and in part because students' current beliefs may be integrated into cohesive theories that can't be easily unraveled and revised. As teachers, we're more likely to promote conceptual change when we determine what misconceptions students have before instruction begins, build on kernels of truth in students' existing understandings, convince students that revision is both warranted and within their grasp, and monitor what students say and write for especially persistent misunderstandings.

7.5 **Describe several factors that influence students' ability to recall what they have previously learned; also describe several reasons why students may either forget or incorrectly remember what they have learned.** Retrieving information from long-term memory appears to be a process of following pathways of associations. In general, content is more memorable if it has emotional overtones or in some other way is unique and distinctive. Furthermore, students are more likely to be successful in recalling what they have learned if they've connected it with other things they know, if they've used it frequently (and perhaps learned it to automaticity), if their environment provides retrieval cues that send them down the right memory "path," and if they're given sufficient wait time to conduct a fruitful long-term memory search. Even under the best of circumstances, however, students sometimes forget or misremember what they've studied, perhaps as a result of insufficient consolidation in the brain, lack of use (resulting in gradual decay), restricted memory search, interference from competing memories, or reconstruction error.

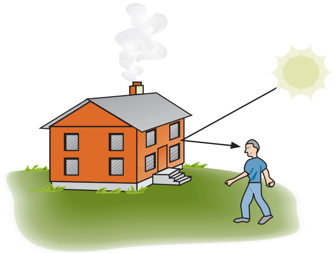
7.6 **Give examples of the diversity in cognitive processes you are likely to see in students, in some cases as a result of students' cultural backgrounds or special educational needs.** Many components of the human memory system—including attention span, working memory capacity, executive functioning, long-term memory storage processes, and prior knowledge—can vary quite a bit from one student to another; as a result, students have varying abilities to learn and remember content. Students' cognitive processes differ, in part, as a function of their cultural worldviews, the kinds of learning tasks and environments to which they're accustomed, and their proficiency with the language in which instruction is being conducted. In addition, some diversity may be the result of certain disabilities. Yet at one time or another, all students are likely to have difficulty understanding and mastering particular topics. By identifying and facilitating cognitive processes that are most likely to lead to effective learning, teachers can better help *all* students achieve classroom success.

Practice for Your Licensure Exam

Vision Unit

Ms. Kontos is teaching a unit on human vision to her fifth-grade class. She shows her students a diagram of the various parts of the human eye, such as the lens, cornea, pupil, retina, and optic nerve. She then explains that people can see objects because light from the sun or another light source bounces off those objects and into their eyes. To illustrate this idea, she shows them Picture A.

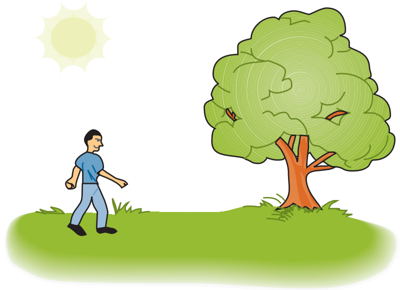
A



"Do you all understand how our eyes work?" she asks. Her students nod that they do.

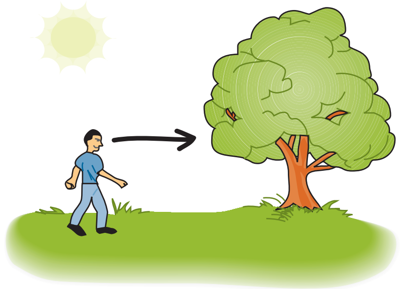
The next day, Ms. Kontos gives every student a copy of Picture B.

B



She asks students to draw one or more arrows on the picture to show how light enables the child to see the tree. More than half of the students draw an arrow similar to the one shown in Picture C.

C



SOURCE: Case based on a study by J. F. Eaton et al., 1984.

1. **Constructed-response question:**

   Obviously, most of Ms. Kontos's students have not learned what she thought she had taught them about human vision.

   A. Explain why many students believe the opposite of what Ms. Kontos has taught them. Base your response on contemporary principles and theories of learning and cognition.

   B. Describe two different ways in which you might improve on this lesson to help students gain a more accurate understanding of human vision. Base your strategies on contemporary principles and theories of learning and cognition.

2. **Multiple-choice question:**

   Many elementary school children think of human vision in the way that Ms. Kontos's fifth graders do—that is, as a process that originates in the eye and goes outward toward objects that are seen. When students revise their thinking to be more consistent with commonly accepted scientific explanations, they are said to be:

   a. acquiring a new script.
   b. revising their worldview.
   c. undergoing conceptual change.
   d. acquiring procedural knowledge.

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 8

Complex Cognitive Processes and Self-Regulation

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Learning Objectives

8.1 Explain how people's metacognitive knowledge and skills influence their learning and academic achievement; also explain how you can promote metacognitive development in your own students.

8.2 Describe various forms that transfer might take the conditions in which transfer is most likely to occur, and apply research findings about transfer to your classroom practices.

8.3 Describe several general factors that influence problem solving and creativity; also describe teaching strategies that can encourage students to think productively and creatively as they tackle new tasks and problems.

8.4 Identify several different forms that critical thinking might take, and explain how you can help students critically evaluate what they see, hear, and read both inside and outside the classroom.

8.5 Identify important components of self-regulated behavior and self-regulated learning, and apply your knowledge of self-regulation to help diverse learners effectively control their behavior, master academic subject matter, and address interpersonal problems.

8.6 Give examples of diversity you might see in transfer, problem solving, creativity, critical thinking, and self-regulated learning as a result of students' cultural backgrounds, disabilities, or advanced cognitive development.

CASE STUDY

Taking Over

When an eighth-grade math teacher goes on maternity leave midway through the year, substitute teacher Ms. Gaunt takes over her classes. In accordance with state standards, the students are expected to master many mathematical concepts and procedures, including working with exponents and irrational numbers, graphing linear equations, and applying the Pythagorean theorem. But many of the students haven't yet mastered more basic concepts and operations, such as percentages, negative numbers, and long division. A few haven't even learned such number facts as $6 \times 3 = 18$ and $7 \times 8 = 56$.

Before long, Ms. Gaunt discovers that many students have beliefs and attitudes that also impede their learning progress. For example, some think that a teacher's job is to present material in such a way that they "get it" immediately and will remember it forever. Thus, they neither work hard to understand the material nor take notes during lessons. And most students are concerned only with getting the right answer as quickly as possible. They depend on calculators to do their mathematical thinking for them and complain when Ms. Gaunt insists that they solve a problem without one. Students rarely check to see whether their solutions make logical sense. For instance, in a problem such as this one:

> Clifford can type 35 words a minute. He needs to type a final copy of his English composition, which is 4,200 words long. How long will it take Clifford to type his paper?

a student might submit an answer of 147,000 minutes—an answer that translates into more than 100 days of around-the-clock typing—and not give the outlandishness of the solution a second thought. (It would actually take Clifford 2 hours to type the paper.)

In mid-April, Ms. Gaunt begins moving through lessons more rapidly so that she can cover the mandated eighth-grade math curriculum before the upcoming statewide math competency exam. "Students can't do well on the exam if they haven't even been exposed to some of the required concepts and procedures," she reasons. "Mastery probably isn't possible at this point, but I should at least *present* what students need to know. Maybe this will help a few of them with some of the test items."

- Why are the students having trouble mastering the eighth-grade math curriculum? Can you identify at least three different factors that appear to be interfering with students' learning?

SOURCE: Case used courtesy of a friend who wishes to be anonymous; "Ms. Gaunt" is a pseudonym.

One factor interfering with the students' success, of course, is their lack of prerequisite knowledge and skills on which the eighth-grade curriculum depends. For instance, if students haven't learned basic number facts to automaticity, even simple word problems may impose too much of a cognitive load on their working memories. But students' beliefs about learning and problem solving are also coming into play. In their minds, learning should come quickly and easily if teachers do their job. They seem not to realize that understanding classroom subject matter is an active, constructive process involving considerable effort on their part and that certain strategies (e.g., taking notes) can enhance their learning. And they view mathematical problem solving as a quick, mindless enterprise that involves plugging numbers into a calculator and writing down the result, rather than a step-by-step process that requires logical reasoning and frequent self-checking.

Study skills and problem solving are examples of **complex cognitive processes**—processes in which learners go far beyond the specific information that is taught. Perhaps they apply it to a new situation, use it to solve a problem or create a product, or critically evaluate it. Mastering basic facts and skills is important, but learners gain little if they can't also *do something* with what they've learned. In this chapter we'll look at a variety of complex cognitive processes, including transfer, problem solving, creativity, and critical thinking. Then, we'll look at the processes through which students think about and control the ways that they apply these various complex cognitive processes while they are doing their work. But we'll begin with a particular set of complex processes that in one way or another influence all of the others: processes that fall into a broad category known as *metacognition*.

Thinking About Thinking and Learning How to Learn: The Importance of Metacognition

Learning Objective 8.1 **Explain how people's metacognitive knowledge and skills influence their learning and academic achievement; also explain how you can promote metacognitive development in your own students.**

The term **metacognition** literally means "thinking about thinking." It encompasses knowledge and beliefs about the general nature of human cognitive processes, reflection on one's *own* cognitive processes, and intentional engagement in behaviors and thought processes that enhance learning and memory. For example, you've undoubtedly learned by now that you can acquire only so much information so fast—you can't possibly absorb the contents of an entire textbook in a single evening. You've also discovered that you can learn information more quickly and recall it more easily if you put it into some sort of organizational framework. Perhaps, too, you've learned that you need to periodically check yourself to make sure you remember and understand what you've read. All of these are examples of metacognition.

A key ingredient of metacognition is a learner's *theory of mind*, described in Chapter 3.

The more learners know about thinking and learning—that is, the greater their *metacognitive awareness*—the better their learning and achievement is likely to be (Hofer & Pintrich, 2002; Schneider, 2010). Furthermore, students who have a more advanced understanding of learning and thinking—for instance, students who realize that one's knowledge of a topic continues to evolve over time—are more likely to undergo conceptual change when it's warranted, and more likely to remain engaged in learning (Mason, 2010; Sinatra & Pintrich, 2003; Wang et al., 2021).

As children grow older, they become increasingly aware of their own thinking and learning processes and more realistic about what they can learn and remember in a given time period (see Table 8.1). With this growing self-awareness come more sophisticated study strategies. One of the most important things that you can do for your students is to help them to acquire (and use!) these strategies. Truly effective strategies emerge quite slowly, however—it takes time and practice for students to see the benefits of using new strategies. Many students of all ages—college students included!—seem relatively uninformed about effective learning strategies (Lovett & Flavell, 1990; Schneider, 2010; Schommer, 1994a; Short et al.,1993).

Chapter 7 describes the development of basic long-term memory storage processes (e.g., see Table 7.4).

Effective Learning Strategies

An important component of metacognition is *controlling* one's own thinking and learning to some degree. Thanks, in part, to maturational changes in the brain, children and adolescents gradually become more capable of controlling and directing their cognitive

DEVELOPMENTAL TRENDS

Table 8.1 Metacognition at Different Grade Levels

Grade Level	Age-Typical Characteristics	Example	Suggested Strategies
K–2	• Awareness of thought in oneself and others, albeit in a simplistic form; limited ability to reflect on the specific nature of one's own thought processes • Considerable overestimation of what has been learned and how much can be remembered • Belief that learning is a relatively passive activity • Tendency to devote equal time to easy study tasks and to more challenging ones • Belief that the absolute truth about any topic is "out there" somewhere, waiting to be discovered	An adult tells 6-year-old Brent that she will read him a list of 12 words; she then asks him to predict how many he'll be able to remember. Brent predicts "about 8 or 9 . . . maybe all of them," but in fact recalls only 6. Later, when the adult asks him what he did to try to remember the words, he says only "Think" and "Holded it, hold it in the brain."	Talk often about thinking processes (e.g., "I *wonder* if . . . " "How might you *remember* to . . . ?"). Provide opportunities for students to experiment with their memories (e.g., playing "I'm going on a trip and I'm going to pack," in which each student repeats items previously mentioned and then adds another item to the list). Introduce simple learning strategies (e.g., rehearsal of spelling words, repeated practice of motor skills).
3–5	• Increasing ability to reflect on the nature of one's own thought processes • Some overestimation of memory capabilities • Emerging realization that learning is an active, constructive process and that people may misinterpret what they observe • Emerging recognition that difficult material requires more study time than does easy material • Continuing belief in an absolute truth "out there"	After reading competing explanations of how ancient humans migrated from Asia to North America, a cooperative learning group in a combined fifth- and sixth-grade classroom concludes that "The more that we learn, the more we get confused about which is fact and which is fiction . . . We have made [our] own theories using information we found and trying to make sense of it."	Provide simple techniques (e.g., self-test questions) that enable students to monitor their progress. Provide explicit guidance about how students might allocate their study time differently, depending on the ease or difficulty of the learning task. Examine scientific phenomena through hands-on activities and experimentation; ask students to make predictions about what will happen and to debate competing explanations for what they observe.
6–8	• Few and relatively ineffective study strategies (e.g., poor note-taking skills, little or no self-monitoring of comprehension) • Belief that "knowledge" about a topic consists largely of a collection of discrete facts • Increasing realization that knowledge can be subjective and that conflicting perspectives may each have some validity (e.g., "people have a right to form their own opinions")	The students in Ms. Gaunt's eighth-grade math class rarely take notes to help them remember new concepts and procedures, and most are more concerned about getting correct answers than about making sense of mathematical operations (see the opening case study).	Teach and model effective strategies within the context of various subject areas. Scaffold students' studying efforts (e.g., provide a structure for note taking, give students questions to answer as they study). Explicitly ask students to reflect on their beliefs about the nature of various academic disciplines (e.g., "Can a math problem sometimes have two *different* right answers?").
9–12	• Growing (but incomplete) knowledge of study strategies that are effective in different situations; persistent use of rote rehearsal by some students • Increasing mastery of covert learning strategies (e.g., intentional use of elaboration, comprehension monitoring) • Increasing recognition that knowledge involves understanding interrelationships among ideas • Increasing recognition that mastering a topic or skill takes time and practice (rather than happening quickly as a result of innate ability) • Emerging understanding that conflicting perspectives should be evaluated on the basis of evidence and logic (seen in a small minority of high school students)	When 16-year-old Hillary is asked to describe the things she does to help her remember what she has learned, she says, "When I'm trying to study for tests, I try to associate the things I'm trying to learn with familiar things . . . with the Spanish words, I'll try to think of the English word that it sounds like . . . sometimes if I can't find any rule, then I just have to memorize it, just try to remember it, just go over it a lot."	Continue to teach and model effective learning strategies; ask students to describe their strategies to one another. Develop assignments and assessments that emphasize understanding, integration, and application, rather than recall of discrete facts. Present various subject areas as dynamic entities that continue to evolve with new discoveries and theories. Have students weigh pros and cons of various explanations using objective criteria (e.g., hard evidence, logical reasoning processes).

SOURCES: Astington & Pelletier, 1996; Bayard et al., 2021; Bendixen & Feucht, 2010; Buehl & Alexander, 2006; Flavell et al., 2021; Grammer et al., 2013; Hatano & Inagaki, 2003; Hewitt et al., 1995, p. 7 (migration example); Hofer & Pintrich, 2002; Kuhn, 2009; Kuhn et al., 1995; Kuhn & Park, 2005; McCrudden & Schraw, 2007; Meltzer et al., 2007; Ornstein et al., 2010; Roebers et al., 2019; Schneider, 2010; Schommer, 1994a, 1997; Short et al., 1993; Wellman, 1985, 1990; Williams et al., 2009.

processes in their efforts to learn something new (Chein & Schneider, 2012; Eigsti et al., 2006). When learners *intentionally* use a certain approach to learning and remembering something, they're using a **learning strategy**.

Information processing theorists have described several processes that may facilitate long-term memory storage, including elaboration, organization, and visual imagery. As children grow older, they increasingly discover the potential benefits of these processes and use them more frequently (Ornstein et al., 2010; Pressley & Hilden, 2006). Children gradually acquire additional strategies as well. For example, consider the simple idea that you need to devote more study time to more difficult material; children don't use this seemingly obvious strategy until the fourth or fifth grade (Schneider, 2010). With age and experience, children also become more aware of which strategies are effective in different situations.

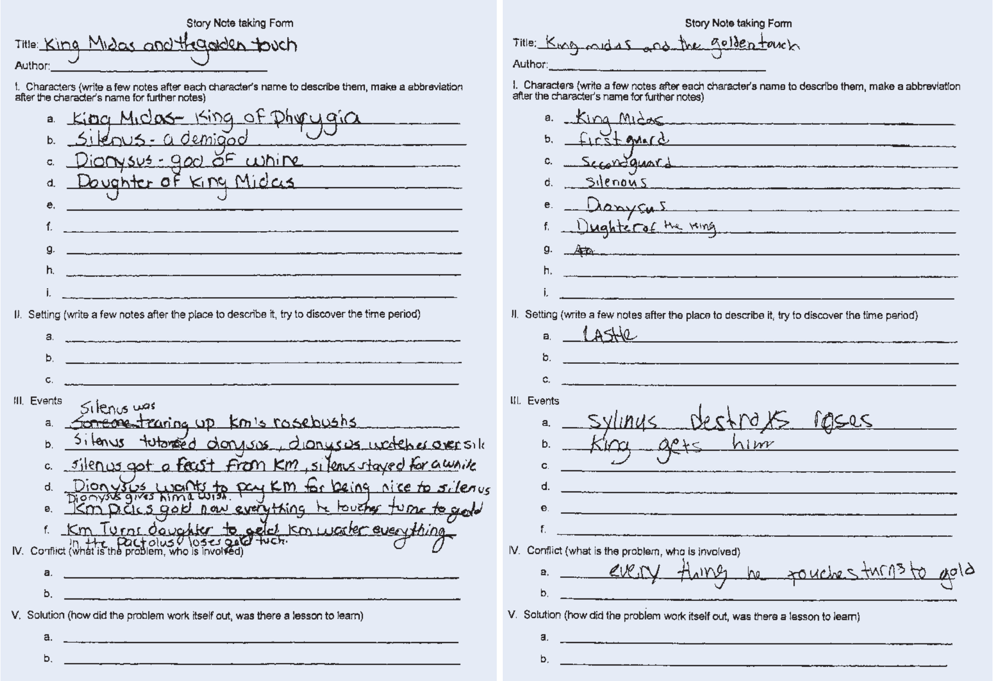
Some learning strategies are **overt strategies**; in other words, they're behaviors we can actually see. Others are **covert strategies**; they're internal mental processes we often *can't* see (Kardash & Amlund, 1991).

Overt Strategies Successful learning and achievement are partly the result of certain behaviors, such as keeping a calendar (either on paper or on a phone) for assignments and due dates, devoting part of every evening to schoolwork, and asking questions in times of confusion. One especially effective overt strategy is *writing* about classroom subject matter (Bangert-Drowns et al., 2004; Shanahan, 2004). Here we look at research on two writing-based learning strategies: taking notes and creating summaries.

Taking Notes By the time students reach the upper elementary or middle school grades, note-taking skills begin to play a role in their achievement. In general, students who take more notes learn and remember content better. However, the quality of the notes is important. Useful notes typically reflect the main ideas of a lesson or reading assignment. Ideally, too, students should be *making sense* of the information they're writing down—perhaps elaborating on it in some way—rather than just copying it in a rote, word-for-word manner (Kiewra, 1989; Lee & Shute, 2010; Mueller & Oppenheimer, 2014). When students are old enough, some may prefer to take notes using a laptop or tablet. The effectiveness of notes taken either by hand or on an electronic device is about the same if the notes are of high quality, although distractions afforded by other apps on a computer or tablet have been shown to sometimes decrease the quality of notes (Voyer et al., 2022).

Despite the advantages of note taking, many young adolescents take few or no notes unless specifically instructed to take them (recall the infrequent note taking in Ms. Gaunt's eighth-grade math class). And the notes they *do* take differ considerably in quality. For example, Figure 8.1 shows the notes that two students took about

Figure 8.1 Two students' class notes on King Midas, taken in a seventh-grade language arts unit on Greek mythology.



Story Note taking Form

Title: King Midas and the golden touch
Author:

I. Characters (write a few notes after each character's name to describe them, make a abbreviation after the character's name for further notes)

a. King Midas- King of Phyrygia
b. Silenus - a demigod
c. Dionysus - god of whine
d. Doughter of King Midas
e.
f.
g.
h.
i.

II. Setting (write a few notes after the place to describe it, try to discover the time period)

a.
b.
c.

III. Events

a. ~~Someone~~ Silenus was tearing up km's rosebushs
b. Silenus tutored dionysus, dionysus watches over sil
c. silenus got a feast from km, silenus stayed for a while
d. Dionysus wants to pay km for being nice to silenus
Dionysus gives him a wish.
e. km picks gold now everything he touches turns to gold
f. Km Turns daughter to gold km washes everything in the Pactolus/ loses gold tuch.

IV. Conflict (what is the problem, who is involved)

a.
b.

V. Solution (how did the problem work itself out, was there a lesson to learn)

a.
b.

Story Note taking Form

Title: King midas and the golden touch
Author:

I. Characters (write a few notes after each character's name to describe them, make a abbreviation after the character's name for further notes)

a. King Midas
b. first guard
c. Secondguard
d. silenous
e. Dionysus
f. Dughter of the king
g. ~~A~~
h.
i.

II. Setting (write a few notes after the place to describe it, try to discover the time period)

a. CAStle
b.
c.

III. Events

a. sylinus destroys roses
b. King gets him
c.
d.
e.
f.

IV. Conflict (what is the problem, who is involved)

a. every thing he touches turns to gold
b.

V. Solution (how did the problem work itself out, was there a lesson to learn)

a.
b.

Dee, Barbara

King Midas in a Greek mythology unit in their seventh-grade language arts class. The notes on the left provide a good overall synopsis of the King Midas story and might reasonably help the student remember the story fairly accurately. In contrast, the notes on the right are probably too brief and disjointed to be useful.

Scaffold students' early note-taking efforts.

Ask students to summarize what they're learning and scaffold their early efforts.

Especially when students are first learning how to take notes, we should scaffold their efforts by giving them an idea about which things are most important to include (Boyle et al., 2015; Meltzer et al., 2007). One approach is to provide a specific structure to use, such as the one shown in Figure 8.1. Another strategy, especially if students are novice note takers, is to occasionally check their notebooks for accuracy and appropriate emphasis and then to give constructive feedback. One of us authors remembers a middle school Spanish teacher who required her students to organize notebooks into distinct sections for (a) vocabulary, (b) verbs, (c) grammar, (d) culture, (e) homework, (f) tests and quizzes, and (g) projects. This organizational structure helped students to think about the different components and processes involved in learning a foreign language (and it greatly helped us when it came time to study for tests, since our notes were so clearly organized).

Creating Summaries Writing short summaries of the material being studied can definitely enhance students' learning and memory (King, 1992; Mayer, 2010; Wade-Stein & Kintsch, 2004). Creating a good summary is a fairly complex process, however. At a minimum, it includes distinguishing between important and unimportant information, synthesizing details into more general ideas, and identifying critical interrelationships. It's not surprising, then, that many middle school and high school students have trouble writing good summaries (Dunlosky et al., 2013; Hidi & Anderson, 1986).

Probably the best way of helping students acquire this strategy is to frequently ask them to summarize what they hear and read. Initially we should scaffold the process for them—for example, by providing compare/contrast tables they can fill in as they read or having them develop summaries in collaboration with peers (Spörer & Brunstein, 2009; Williams et al., 2009).

Covert Strategies Students' overt strategies are probably valuable only to the extent that effective cognitive processes, or *covert strategies*, underlie them (Kardash & Amlund, 1991). For example, high-achieving students tend to benefit more from note taking than low-achieving students, perhaps because the high-achieving students are more likely to engage in meaningful learning (e.g., elaboration and internal organization) as they take notes (Kiewra et al., 1987; Ku et al., 2008). In addition to meaningful learning processes, two covert strategies that may be especially critical for effective classroom learning and achievement are (1) accurately identifying important information and (2) regularly self-monitoring learning.

Identifying Important Information The human memory system isn't a video or audio recorder; it simply can't take in and retain *all* the information a typical classroom curriculum presents. Thus, students must be quite selective about what they focus on and study. The things they choose to study—whether main ideas and essential supporting details or, instead, isolated facts and trivia—inevitably affect their learning and achievement.

Let students know what things are most important to learn and remember.

Students often have trouble identifying the most important information in a lesson or reading assignment, especially when they don't know very much about the topic at hand. Many use relatively superficial strategies in choosing what to focus on—for instance, zeroing in on definitions and formulas, taking notes only on things their teacher writes on the board, or reading only the first sentence of each paragraph—and miss critical ideas as a result.

As teachers, we can, of course, simply tell students exactly what they should study. But we can also highlight important ideas through more subtle means:

- Provide a list of learning objectives for a lesson.
- Write key concepts and relationships on the board.
- Ask questions that focus students' attention on central ideas.

Students—low-achieving ones especially—are more likely to learn the essential points of a lesson when such prompts are provided for them (McCrudden & Schraw, 2007; Reynolds & Shirey, 1988; Schraw et al., 1993). As students become better able to distinguish between important and unimportant information on their own, we can gradually phase out our guidance.

Regularly Monitoring Learning One very powerful learning strategy is **comprehension monitoring**, a process of periodically checking oneself for recall and understanding. How well do *you* monitor your comprehension? The following exercise can help you find out.

Experiencing Firsthand

Looking Back

Stop for a minute and ask yourself this question:

> What have I learned from this chapter so far?

Quickly jot down what you can recall.

Now go back and look at the pages preceding this one. Did what you wrote down include most or all of the key points presented in those pages? Is there something you thought you understood but realize now that you don't? Is there something you never learned at all—perhaps something you were supposedly "reading" when your mind was thinking about something entirely different?

Successful learners continually monitor their comprehension both *while* they study something and at some point *after* they've studied it (Hacker et al., 2009b; Sodorstrom & Bjork, 2015). Furthermore, when they realize they don't understand something, they take steps to correct the situation, perhaps by rereading a section of a textbook or asking a question in class. In contrast, low achievers rarely check themselves or take appropriate action when they don't comprehend something. For example, they're unlikely to reread paragraphs they haven't understood the first time around (Baker & Brown, 1984; Haller et al., 1988; Veenman, 2011).

Many students engage in little or no comprehension monitoring (McKeown & Beck, 2009; Nokes & Dole, 2004). When they don't monitor their learning and comprehension, they may think they've mastered something when they really haven't. Although this **illusion of knowing** is especially common in young children, it's seen in learners at all levels, even college students. Furthermore, when students' prior knowledge about a particular topic is limited, their ability to monitor their own progress may be less accurate than they think it is (Mihalca et al., 2017; Mihalca & Mengelkamp, 2020). As paper-and-pencil exams become increasingly prevalent at upper grade levels, an illusion of knowing can lead students to overestimate how well they'll perform on these assessments (Hacker et al., 2000; Sodorstrom & Bjork, 2015; Stone, 2000). For example, we authors occasionally have students come to us expressing frustration with low test scores. "I knew the material so well!" they might say. But as we begin to talk with them about the exam material, it usually becomes clear that they have only vague understandings of some ideas and incorrect understandings of others.

Comprehension monitoring doesn't have to be a solitary activity, of course. If students work in small study groups, they can easily test one another on material and may detect gaps or misconceptions in one another's understandings (Bol et al., 2012; Dunning et al., 2004; Vaughn et al., 2011). Ideally, the questions they ask one another should encourage them to elaborate on rather than simply recall what they're studying. For example, we might teach them to ask questions beginning with such phrases as "Explain why_____," "What do you think would happen if_____," and "What is the difference between_____" (King, 1992, p. 309).

Teach students strategies for monitoring their own and others' learning progress.

To be truly effective learners, students must ultimately learn how to *take the time to think about what and how they are learning, while they are actually "doing the learning" (e.g., while they are studying something).* One effective strategy is **self-explanation**, in which students frequently stop to explain to themselves what they're studying (Fonseca & Chi, 2011; McNamara & Magliano, 2009). Another, similar approach is **self-questioning**, in which students periodically stop to ask themselves questions—essentially internalizing the mutual question-asking process they may have previously used in small-group study sessions. Their self-questions should, of course, include not only simple, fact-based questions but also elaborative ones (Bugg & McDaniel, 2012; Wong, 1985).

Factors Affecting Strategy Use

As we've seen, students become increasingly capable of using effective learning strategies as they grow older, in part because they can better control and direct their cognitive processes. With age, too, comes an ever-expanding knowledge base that supports students' efforts to engage in elaboration, identify important information, and monitor their comprehension. Several other factors also influence students' choice and use of various strategies, as reflected in the following principles.

- *Learning strategies depend partly on the learning task at hand.* In some situations, teachers may assign tasks for which truly effective learning strategies are either counterproductive or impossible. For instance, if we insist that facts and definitions be learned verbatim, students will understandably be reluctant to engage in elaboration and other meaningful learning processes (Turner, 1995; Van Meter et al., 1994). And if we expect students to master a great deal of material for a single exam, they may have to devote their limited study time to getting only a superficial impression of everything or to studying only the easy material they're confident they can master (Son & Schwartz, 2002; Thomas, 1993). Sometimes working memory's limited capacity discourages metacognitive processing: If a task involves thinking about a lot of information all at once—that is, if it imposes a heavy **cognitive load**—students may have insufficient "room" in working memory to use strategies that might otherwise be effective (Kalyuga, 2010; Waters & Kunnmann, 2010).

When you require students to memorize a great deal of information for an exam, think about whether they *really* need to memorize all that information—perhaps it would be better for them to use that information in a meaningful way.

- *Students are likely to acquire and use new, more effective strategies only if they realize that their current strategies are not working.* Students will come to such a conclusion if they have been regularly monitoring their comprehension and become aware of their learning difficulties, or if a caring teacher points out that a strategy may be ineffective. Comprehension monitoring, then, doesn't just affect students' understanding of classroom subject matter—it also plays a pivotal role in the development and use of *other* metacognitive strategies (Kuhn et al., 1995; Lodico et al., 1983). In some cases, too, explicit feedback that students haven't yet mastered a new topic or skill will spur them to adopt more effective strategies, at least for the short run (Starr & Lovett, 2000).
- *Students' beliefs about the nature of knowledge and learning influence their strategy choices.* Children and adolescents can have misconceptions about knowledge and learning across all subjects. For example, for many years one of us authors found history to be extremely boring, and just thought of the subject as a bunch of rather useless facts to memorize. When a thoughtful teacher emphasized that "We study

history because sometimes we don't want history to repeat itself," the author's valuing of history as a subject area changed (for the better). Recall that in the opening case study, Ms. Gaunt's students think that math consists simply of a bunch of procedures that yield single right answers but don't necessarily have to make sense. Furthermore, many students have misconceptions about the general nature of learning. Ms. Gaunt's students think they should be able to learn mathematical concepts and procedures quickly and easily—with little or no effort on their part—as long as their teachers do their job.

Students' beliefs about the nature of knowledge and learning are collectively known as **epistemic beliefs** (you may also see the term *epistemological* beliefs). Such beliefs often influence how our students study and learn (Bendixen & Feucht, 2010; Hofer & Pintrich, 1997; Muis, 2007). For example, when students believe that learning happens quickly in an all-or-none fashion—as Ms. Gaunt's students apparently do—they're apt to think they've mastered something before they really have. Furthermore, they tend to give up quickly in the face of failure and express discouragement or dislike regarding the topic they're studying. In contrast, when students believe that learning is a gradual process that often takes time and effort, they're likely to use a wide variety of strategies as they study and to persist until they've made sense of the material (Butler & Winne, 1995; Muis, 2007; Schommer, 1990, 1994b).

As another example of variability in learners' epistemic beliefs, some students believe that when they read a textbook, they're passively soaking up many separate pieces of information from the page. In contrast, other students recognize that learning from reading requires them to construct their own meanings by actively interpreting, organizing, and applying new information. Learners who realize that reading is a constructive, integrative process are more likely to engage in meaningful learning as they read and to undergo conceptual change when they encounter ideas that contradict their existing understandings (Mason et al., 2008; Schommer-Aikins, 2002; Sinatra & Pintrich, 2003).

As children develop, they become better able to actually think about the nature of knowledge, a process referred to as **epistemic metacognition** (Tang, 2020). Epistemic beliefs tend to evolve throughout childhood and adolescence (Atance & Caza, 2018; Kuhn & Park, 2005; Muis et al., 2006; Schommer et al., 1997). Children in the elementary grades typically believe in the certainty of knowledge: They think that for any topic there's an absolute truth "out there" somewhere. As they reach high school, some of them—and *only* some—begin to realize that knowledge is subjective and that different perspectives on a topic can occasionally be equally valid. Additional changes can occur over the course of the high school grades. For example, twelfth graders are more likely than ninth graders to believe that knowledge consists of complex interrelationships rather than discrete facts, and that most learning happens gradually over time rather than in a quick, one-shot effort. Such developmental trends are reflected in some of the entries in Table 8.1.

Chapter 7 explains the difference between implicit and explicit knowledge.

Learners' epistemic beliefs typically take the form of *implicit knowledge*—or *mis*knowledge—in that they lie outside of learners' conscious awareness. Accordingly, we teachers must actively and explicitly communicate productive beliefs about the nature of knowledge and learning, including the following:

- Knowledge involves not only knowing facts, concepts, and ideas but also understanding interrelationships among these things.
- Learning involves active construction of knowledge, rather than just a passive absorption of it.
- Knowledge doesn't always mean having clear-cut answers to difficult, complex issues, and in some cases, it involves critically evaluating available evidence relative to a particular point of view.
- Mastering a body of information or a complex skill often requires hard work and persistence.

Communicate that genuinely useful knowledge tends to be complex rather than simple and that learning can require considerable thought and effort.

- Human beings' collective knowledge about any topic or phenomenon is a dynamic, ever-evolving entity; thus, acquiring such knowledge must, by necessity, be an ongoing effort over the course of one's lifetime.

We should communicate such messages not only in what we say but also in what we *do*, such as in the questions we ask, the activities we assign, and the ways in which we assess learning. For example, we can have students address complex issues and problems that have no clear-cut right or wrong answers. We can teach students strategies for gathering data and testing competing hypotheses. We can ask students to compare several explanations of a particular phenomenon and consider the validity and strength of evidence supporting each one. And we can show students, perhaps by presenting puzzling phenomena, that their current understandings—and in some cases even those of experts in the field—don't yet adequately explain all of human experience. When we do such things, we increase the likelihood that students will use effective learning strategies, critically evaluate what they are learning, and undergo conceptual change when appropriate (Bendixen & Feucht, 2010; Fives et al., 2017; Kuhn, 2009; Reznitskaya & Gregory, 2013; Zepeda et al., 2019).

We must be careful how far we take such strategies, however. When students are firmly rooted in *learning-involves-facts-that-I-can-get-only-from-an-expert* beliefs, they may initially find little of value in—and so may gain little from—lessons that emphasize diverse perspectives and offer few solid answers. Nudging students toward more sophisticated beliefs about the nature of knowledge can take time, gentle prodding, and persistence, as well as a classroom atmosphere in which students feel comfortable questioning their own and others' beliefs (Andre & Windschitl, 2003; Rule & Bendixen, 2010).

The discussion of motivation in Chapters 10 and 11 identify many things teachers can do to overcome such impediments to successful learning and achievement.

- *Different motives and goals call for different strategies*. Motivational factors influence the extent to which students use effective strategies to learn and study. Some students may be more interested in getting by with a passing grade than in truly mastering material, and consequently they may not see any value and engaging in deep thought about what they are learning. Other students may think that effective learning strategies involve too much time and effort to be worthwhile. Still others may have so little faith in their learning ability that they expect to do poorly regardless of the strategies they use (Anderman, 2020; Alexander et al., 1998; Mason, 2010; Nolen, 1996).
- *Ongoing instruction and guidance about effective strategies enhances learning and achievement.* With every transition to a higher educational level, teachers expect students to learn more material and to think about it in more sophisticated ways. Thus, the simple learning strategies children acquire in elementary school (e.g., rehearsal) become less and less effective with each passing year. All too often, however, teachers provide instruction in academic content areas (e.g., history, biology, math) without also teaching students how to *learn* in those content areas. When left to their own devices, most students develop effective strategies very slowly (if at all) and thus, over the years, encounter increasing difficulty in their attempts to master classroom subject matter. And when they *don't* master it, they may not know why they've failed or how to improve their chances of success the next time around.

  Using effective learning strategies makes such a difference in students' classroom achievement that we mustn't leave the development of these strategies to chance. How can we help students *learn how to learn?* The Into the Classroom feature "Promoting Effective Learning and Study Strategies" presents several evidence-based strategies. The most important of the strategies presented there is this one: *When teaching academic content, simultaneously teach students how to effectively study and remember it.* Don't assume that your students know how to do this! Students are more likely to use effective learning and study strategies when those strategies are taught not in separate study-skills classes but rather as integral parts of everyday instruction about specific academic topics (Hattie et al., 1996; Pressley et al., 1992; Veenman, 2011).

Into the Classroom

Promoting Effective Learning and Study Strategies

- **Using age-appropriate language, occasionally talk explicitly about thinking and memory.**

  When a kindergarten teacher explains important safety rules at school, at one point she pauses and says, "All of us really need to remember these rules, don't we? We want them to stick in our heads so that everyone in the class stays happy and healthy. What might we do to help ourselves remember the rules?" In the brainstorming session that follows, students offer suggestions such as "Talk about them a lot" and "Draw pictures of them."

- **When teaching academic content, simultaneously teach students how to effectively study and remember it.**

  When a second-grade teacher presents the new spelling words for the week, he asks students to practice writing each word once by itself and once in a sentence. He also asks students to think about how some of the words are spelled similarly to words they already know (e.g., "The word *clown* ends in the letters *o-w-n.* What other words have you learned that end with those letters?"). And he teaches his students the mnemonic "*I* before *E* except after *C* . . . " to help them remember the spellings of such words as *believe* and *receive.*

- **Suggest and demonstrate a wide variety of overt and covert strategies (e.g., taking notes, thinking of new examples, creating mnemonics, summarizing, taking self-check quizzes), each of which is apt to be useful in different situations and for different purposes.**

  A high school social studies teacher acknowledges that some aspects of geography, such as the names of European capital cities, can be hard to remember. She suggests the keyword mnemonic and illustrates this process with the capital of Belgium, which is Brussels: "Think of a large *bell* with eyes and a mouth, and picture it eating some *Brussels* sprouts." But in addition, the teacher points out that many aspects of geography make sense and should be understood rather than memorized. For example, when presenting a map of Europe one day, she says, "Notice how most European capitals are on major rivers. Why do you suppose that is?"

- **Scaffold students' attempts to use new strategies—for instance, by modeling the strategies, giving clues about when to use them, and providing feedback regarding productive and unproductive strategy use.**

  A seventh-grade language arts teacher gives her students note-taking forms they can use to take notes in a unit on Greek mythology (see Figure 8.1).

- **Explain the usefulness of various strategies in an age-appropriate way.**

  A high school economics teacher asks his class, "Who can tell me why the prices of things that we buy in the supermarket fluctuate over time? We talked about that last week. Does anyone remember?" When no one responds, the teacher continues, "A lot of kids don't realize this, but people often can't remember things they hear unless they write those things down. It's time we started getting serious about taking notes in this class." The teacher gives some initial pointers on how and when to take notes and continues to scaffold the students' note taking over the course of the school year, sometimes simply by saying, "This is an important point, so you should be sure to include it in your notes."

- **Ask students to self-reflect about their learning progress and the strategies they are using to master classroom subject matter.**

  A high school math teacher regularly asks students to write in their "learning journals," in which they identify important ideas of a lesson, make connections between things they're learning and things they already know, self-reflect on the quality of their current understandings, and plan follow-up strategies that might enhance their mastery of the material.

- **Occasionally ask students to study instructional material in pairs or small cooperative learning groups.**

  In a unit on the human muscular system, seventh graders are given "starters" (e.g., "Describe ____________ in your own words"; "Compare ____________ with respect to ____________") to help them formulate elaboration-promoting questions to ask a study partner. The students then break into pairs to study together. Many of them generate and are able to answer such elaborative questions as "Why are muscles important?" and "How are the skeletal muscles and the cardiac muscles the same?"

- **Have students share their strategies with one another.**

  A middle school science teacher organizes her students into small groups to do laboratory assignments. Once per week, she has the groups meet to discuss the ways that each of them approached both their lab work and how they have studied that week, encouraging them to discuss which strategies they found particularly useful.

SOURCES: Alexander et al., 1998; Glogger et al., 2012 (learning journals example); Grammer et al., 2013; Hacker et al., 2009b; Hattie et al., 1996; King et al., 1998 (muscular system example, pp. 139, 141); Kucan & Beck, 1997; McCrudden & Schraw, 2007; Meltzer et al., 2007; Nokes & Dole, 2004; Pressley & Hilden, 2006; Vaughn et al., 2011; Veenman, 2011; Weinstein & Hume, 1998; Wentzel, 2009.

Metacognitive Strategies in the Digital Age

In many traditional modes of instruction—lectures and explanations, textbook readings, and the like—teachers are largely in control of what students study and in what order they study it. In the 21st-century digital age, however, many instructional materials take the form of **hypermedia**, in which students can go from one electronic "page" to another one of their own choosing simply by clicking on a word, icon, picture, or "button" on the screen. Hypermedia can be found both in prepackaged instructional software programs and in instructional websites. And, of course, the internet itself is a virtually boundless form of hypermedia.

Acquiring new information from the internet and other forms of hypermedia requires not only the kinds of learning strategies previously described but a few additional ones as well. Among other things, effective learners must do most or all the following when they use computer-based materials to acquire new information:

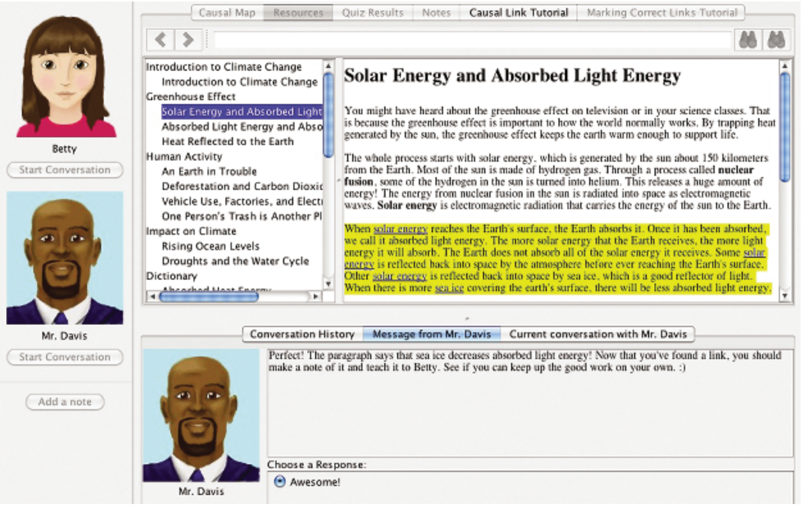
- Identify potentially productive keywords to use in a search for particular information
- Make good choices about paths and hotlinks to follow
- Identify specific learning goals to be accomplished and monitor progress toward achieving those goals
- Make adjustments in goals and search strategies as new information comes to light
- Critically evaluate the information and potential *mis*information found on various websites (more on this issue in the discussion of critical thinking later in the chapter)
- Compare, contrast, and synthesize information obtained from two or more sources (Afflerbach & Cho, 2010; Alexander & the Disciplined Reading and Learning Research Laboratory, 2012; Azevedo & Witherspoon, 2009; Leu et al., 2009)

Many people of all ages don't have such skills, especially if they have little prior knowledge about a topic or naively assume that everything posted on the internet must be "fact" (Greene et al., 2012; Kirschner & van Merriënboer, 2013; Niederhauser, 2008). As you might guess, most elementary and secondary school students need considerable teacher guidance and scaffolding to learn effectively from hypermedia-based instructional resources.

Fortunately, some software explicitly scaffolds students' learning strategies during computer-based instruction and online research. For example, a program might occasionally encourage students to set goals for their learning or ask them to identify causal relationships among concepts. Moreover, as students search the internet for resources about a particular topic, computer-based scaffolding might occasionally remind them about their goal(s) in conducting the research or about the criteria they should use to evaluate the contents of a particular website (e.g., see Afflerbach & Cho, 2010; Belland et al., 2017; Koedinger et al., 2009). Students benefit when adults interact with them while they are engaged in computer-based instruction (Arvidsson & Kuhn, 2021).

A good example of technology-based metacognitive scaffolding is *Betty's Brain*, a computer-based learning environment in which students read several resources about a topic such as body temperature regulation or climate change and then create a concept map representing the cause-and-effect relationships they discover in the resources. Students are told that a "child" named Betty has to learn about the topic and that they can help her learn through the map they create as Betty's "teacher." Like a good teacher, they should also periodically assess her understanding with questions or a quiz. If Betty doesn't perform well, students can work to improve her understanding, and in the process they learn a great deal about the topic themselves. For example, Figure 8.2 shows an in-progress unit on climate change. The student/teacher has made some inappropriate causal links in her concept map, leading computer-based Betty to perform poorly on assessments. A virtual "mentor" (Mr. Davis) has stepped in to provide guidance about how to identify cause-and-effect relationships in a small section of text. Here the student

Figure 8.2 In this screenshot from *Betty's Brain*, a student has at this point created an inadequate concept map of cause-and-effect relationships affecting climate change. "Mr. Davis" has stepped in to provide scaffolding and feedback to guide the student.


Causal Map
Resources
Quiz Results
Notes
Causal Link Tutorial
Marking Correct Links Tutorial
Betty
Start Conversation
Mr. Davis
Start Conversation
Add a note
Introduction to Climate Change
Introduction to Climate Change
Greenhouse Effect
Solar Energy and Absorbed Light
Absorbed Light Energy and Abso
Heat Reflected to the Earth
Human Activity
An Earth in Trouble
Deforestation and Carbon Dioxic
Vehicle Use, Factories, and Electi
One Person's Trash is Another Pl
Impact on Climate
Rising Ocean Levels
Droughts and the Water Cycle
Dictionary
Conversation History
Message from Mr. Davis
Current conversation with Mr. Davis
Mr. Davis

Solar Energy and Absorbed Light Energy

You might have heard about the greenhouse effect on television or in your science classes. That is because the greenhouse effect is important to how the world normally works. By trapping heat generated by the sun, the greenhouse effect keeps the earth warm enough to support life.

The whole process starts with solar energy, which is generated by the sun about 150 kilometers from the Earth. Most of the sun is made of hydrogen gas. Through a process called **nuclear fusion**, some of the hydrogen in the sun is turned into helium. This releases a huge amount of energy! The energy from nuclear fusion in the sun is radiated into space as electromagnetic waves. **Solar energy** is electromagnetic radiation that carries the energy of the sun to the Earth.

When solar energy reaches the Earth's surface, the Earth absorbs it. Once it has been absorbed, we call it absorbed light energy. The more solar energy that the Earth receives, the more light energy it will absorb. The Earth does not absorb all of the solar energy it receives. Some solar energy is reflected back into space by the atmosphere before ever reaching the Earth's surface. Other solar energy is reflected back into space by sea ice, which is a good reflector of light. When there is more sea ice covering the earth's surface, there will be less absorbed light energy.

Perfect! The paragraph says that sea ice decreases absorbed light energy! Now that you've found a link, you should make a note of it and teach it to Betty. See if you can keep up the good work on your own. :)

Choose a Response:

● Awesome!

The *Betty's Brain* system has been developed by the Teachable Agents Group at Vanderbilt University with financial support from the Institute for Educational Sciences and the National Science Foundation. Used with permission.

has just correctly identified a relationship—*sea ice decreases absorbed light energy*—and Mr. Davis has suggested a good next step. (For more information about *Betty's Brain*, see Biswas et al., 2016; Leelawong & Biswas, 2008; Segedy et al., 2013; also, go to https://wp0.vanderbilt.edu/oele/bettys-brain/.)

Diversity, Disabilities, and Exceptional Abilities in Metacognition

As you might imagine, there are cultural differences in students' epistemic beliefs—in particular, their beliefs about what it means to *learn* something. From the perspective of mainstream Western culture, learning is largely a mental enterprise: People learn in order to understand the world and acquire new skills and abilities. But for many people in China, learning also has moral and social dimensions: It enables an individual to become increasingly virtuous and honorable and to contribute in significant ways to the betterment of society (Li, 2005).

Researchers have uncovered other cultural differences in learners' epistemic beliefs as well. For instance, beginning in middle school, students in the United States are more likely to question the validity of an authority figure's claims than are students in Asia. In contrast, students in Asian countries (e.g., China, Japan, Korea) are more likely to believe that knowledge is cut-and-dried and can be effectively gained from authority figures (Chang et al., 2011; Kuhn & Park, 2005; Qian & Pan, 2002). Compared to many European American students (who sometimes expect quick results with little work), students of Asian heritage often are more likely to believe that mastering complex academic topics is a slow, effortful process requiring diligence, persistence, and a combination of rote and meaningful learning (Chang et al., 2011; Dahlin & Watkins, 2000; Li, 2005; Schommer-Aikins & Easter, 2008; Tweed & Lehman, 2002).

Remember that students' learning strategies and beliefs about learning may be partly the result of their cultural backgrounds.

Chapter 5 identifies specific categories of special needs that fall within the five general categories listed in Tables 8.2 and 8.3 in this chapter.

Accommodating Students with Special Needs We're especially likely to see diversity in metacognition in students who have special educational needs. Table 8.2 presents characteristics you might see in these students. Notice that many students with cognitive disabilities—and some with emotional and behavioral disorders as well—may exhibit little knowledge and use of effective learning strategies. In contrast, students who are gifted often have more sophisticated learning strategies than their peers.

STUDENTS IN INCLUSIVE SETTINGS

Table 8.2 Promoting Metacognitive Development in Students with Special Educational Needs

Category	Characteristics You Might Observe	Suggested Strategies
Students with specific cognitive or academic difficulties	• Less metacognitive awareness or control of learning • Less likely to apply effective strategies in new situations • Use of few and relatively inefficient learning strategies • Increased strategy use after explicit instruction in strategies	• Teach effective learning and reading strategies (e.g., taking notes, using mnemonics, identifying main ideas) within the context of lessons about particular topics. • Model effective strategies and scaffold students' efforts to use them (e.g., provide outlines to guide note taking, ask questions that encourage activation of prior knowledge).
Students with social or behavioral problems	• Limited metacognitive awareness of one's processing difficulties (for some students) • For some, fewer effective learning strategies than their same-aged peers	• Provide guidance in using effective learning and study strategies (e.g., verbally model strategies, give outlines that guide note taking).
Students with general delays in cognitive and social functioning	• Lack of metacognitive awareness or control of learning • Lack of learning strategies, especially in the absence of strategies training	• Teach relatively simple learning strategies (e.g., rehearsal, specific mnemonics), and give students ample practice in using them.
Students with physical or sensory challenges	• No consistently observed deficits in metacognitive knowledge or strategies; specific deficits sometimes due to sensory impairments	• Address any deficits in metacognition with strategies you would use with general education students, making appropriate accommodations for physical and sensory limitations.
Students with advanced cognitive development	• Use of relatively sophisticated learning strategies in comparison with peers	• Don't assume that students have adult-like learning strategies; assess their existing strategies and, as appropriate, encourage more effective strategies (e.g., elaboration, comprehension monitoring). • Provide opportunities for self-directed learning if students clearly have effective learning strategies they can use with little teacher guidance.

SOURCES: Beirne-Smith et al. 2006; Boyle et al., 2015; Clark, 1997; Edmonds et al., 2009; Ellis & Friend, 1991; Geurten & Lemaire, 2022; Graham & Harris, 1996; Gregg, 2009; Grodzinsky & Diamond, 1992; Heward, 2009; Mastropieri & Scruggs, 2007; Meltzer, 2007; Mercer & Pullen, 2005; Piirto, 1999; Pressley, 1995; Swanson, 1993; Turnbull et al., 2016; Waber, 2010; Wong, 1991.

For many students with disabilities, we may have to teach metacognitive skills explicitly and with considerable scaffolding—that is, with close guidance and assistance in the use of specific learning strategies (e.g., Boyle et al., 2015; Meltzer, 2007). For example, we might provide partially filled-in outlines to guide students' note taking (e.g., see Figure 8.3). We might also tell students when particular strategies (e.g., elaboration, comprehension monitoring) are appropriate and model the use of such strategies. Finally, we must give students opportunities to practice their newly acquired strategies, along with feedback about how effectively they are using each one.

As teachers, we must remember that our students are likely to learn differently—and often less efficiently and successfully—than we do. Almost all of them can benefit from acquiring more sophisticated understandings of what knowledge and learning involve and from regularly practicing effective strategies.

Keep in mind that your students are apt to be less effective learners than you are.

Transfer

Learning Objective 8.2 Describe various forms that transfer might take, the conditions in which transfer is most likely to occur, and apply research findings about transfer to your classroom practices.

How students think about and study school subject matter has implications not only for how well they can understand and remember it but also for how effectively they can *use and apply* it later on. Here we're talking about **transfer**: the extent to which knowledge and skills acquired in one situation affect a person's learning or performance in a subsequent situation. Following are examples:

- Elena speaks both English and Spanish fluently. When she begins a French course in high school, she immediately recognizes many similarities between French and Spanish. "Aha," she thinks, "what I know about Spanish will help me learn French."

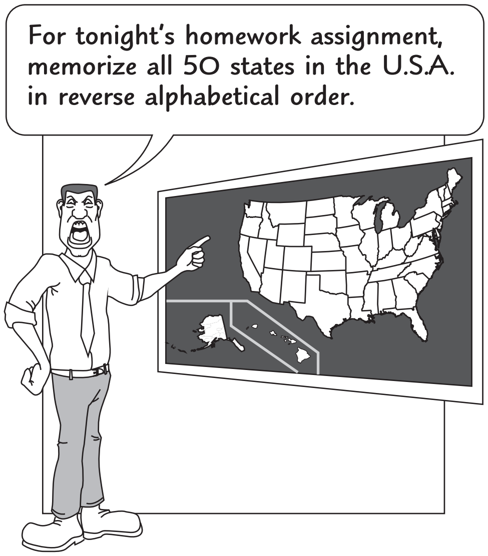
Figure 8.3 Example of a partially filled-in outline that can guide students' note taking.

MUSCLES

A. Number of Muscles
   1. There are approximately ______________ muscles in the human body.
B. How Muscles Work
   1. Muscles work in two ways:
      a. They ______________, or shorten.
      b. They ______________, or lengthen.
C. Kinds of Muscles
   1. ________________ muscles are attached to the bones by ________________.
      a. These muscles are _________________ (voluntary/involuntary).
      b. The purpose of these muscles is to ________________________________
      ____.
   2. ________________ muscles line some of the body's ________________.
      a. These muscles are __________________________ (voluntary/involuntary).
      b. The purpose of these muscles is to ________________________________
      ____.
   3. The __________________ muscle is the only one of its kind.
      a. This muscle is __________________ (voluntary/involuntary).
      b. The purpose of this muscle is to __________________________________
      ____.

- In her middle school history class, Maggie discovers that she does better on quizzes when she takes more notes. She decides to take more notes in her science class as well, and once again the strategy pays off.
- Ted's fifth-grade class has been working with decimals for several weeks. His teacher asks, "Which number is larger, 4.4 or 4.14?" Ted recalls something he knows about whole numbers: Numbers with three digits are larger than numbers with only two digits. "The larger number is 4.14," he mistakenly concludes.

Transfer always involves prior learning. In most cases, prior learning *helps* learning or performance in another situation. Such **positive transfer** takes place when Elena's Spanish helps her learn French and when Maggie's practice with note taking in history class improves her performance in science class. In some instances, however, existing knowledge or skills *hinder* later learning. Such **negative transfer** is the case for Ted, who transfers a principle related to whole numbers to a situation in which it doesn't apply: comparing decimals.


For tonight's homework assignment, memorize all 50 states in the U.S.A. in reverse alphabetical order.

Rote memorization tasks such as this one have little or no benefit, because neither the information to be learned nor the "mental exercise" involved is likely to transfer to future situations. Furthermore, such tasks communicate the message that schoolwork is a waste of time.

Sometimes we see **specific transfer**, in which the original learning task and the transfer task overlap in content. For example, Elena should have an easy time learning to count in French because the numbers (*un, deux, trois, quatre, cinq* . . .) are very similar to the Spanish ones she already knows (*uno, dos, tres, cuatro, cinco* . . .). At other times we may see **general transfer**, in which learning in one situation affects learning and performance in a somewhat dissimilar situation. Consider, for example, Maggie's strategy of taking more notes in science because of her success with note taking in history. History and science don't overlap much in content, but a strategy acquired in one class helps with learning in the other.

Historically, research has shown that when application of academic subject matter is involved, specific transfer occurs far more often than general transfer (Barnett & Ceci, 2002; Gray & Orasanu, 1987). In fact, the question of whether general transfer occurs at all has been the subject of considerable debate over the years. Many early educators believed that subject areas requiring considerable attention to precision and detail (e.g., math, Latin, formal logic) might somehow strengthen students' minds and thereby enable students to tackle other, unrelated tasks more easily. This **formal discipline** perspective of transfer persisted throughout the first several decades of the 20th century. For instance, all of the authors of this book were encouraged to take Latin. One of us asked, "Why should I take Latin? I can use it only if I attend Catholic mass or run across phrases like *caveat emptor* or *e pluribus unum*." The school guidance counselor gave a look suggesting that she knew best. "Latin will discipline your mind," the counselor said. "It will help you learn better."

Most research has discredited this mind-as-muscle notion of transfer. For example, practice in memorizing poems doesn't necessarily make one a faster poem-memorizer. Intensive training in music or chess, while certainly enhancing people's abilities in these specific domains, doesn't enhance people's cognitive abilities more generally. While many of us would like to believe that playing classical music for infants will make them smarter, there is no evidence that this actually happens (Pietschnig et al., 2010). And many claims about the benefits of so-called "brain-training" programs—especially those created and marketed by private, for-profit companies—are based on questionable research methods and data analyses (Haskell, 2001; James, 1890; Sala & Gobet, 2017; Simons et al., 2016).

We're more likely to see general transfer when we broaden our notion of transfer to include general academic skills and learning strategies that can be applied to a wide variety of topics and contexts (e.g., reading comprehension, persuasive writing, note taking) (Anderson et al., 2000; Barnett & Ceci, 2002; Posner & Rothbart, 2007). Some research suggests that learning computer programming is related to improved creativity, math skills, and metacognition (Scherer et al., 2019). Furthermore, general beliefs, attitudes, and dispositions related to learning and thinking—for instance, recognition that learning often requires hard work, as well as open-mindedness to diverse viewpoints—can have a profound impact on later learning and achievement across multiple domains and so clearly illustrate general transfer at work (Cornoldi, 2010; De Corte, 2003; Pugh & Bergin, 2006; Schwartz et al., 2005). And some students develop a general desire to apply what they learn in the classroom—that is, they have a *spirit of transfer*—that consistently resurfaces in later instructional contexts (Goldstone & Day, 2012; Haskell, 2001).

Chapter 5 describes open-mindedness and other general dispositions that positively influence students' learning and achievement.

Factors Affecting Transfer

Ideally, *positive* transfer to real-world contexts should be a major goal in classrooms at all grade levels. Yet students often *don't* apply the academic content they learn in particular classes to other classes or to out-of-school situations. Therefore, as teachers, we should not assume that students will automatically transfer information and strategies learned in one context to another (Levstik, 2011; Perkins & Salomon, 2012; Renkl et al., 1996; Taatgen, 2013). Naturally, students are more likely to transfer what they learn at school when they approach each classroom topic with a deliberate intention to apply it. But several other factors also influence the probability of transfer, often because they influence learners' ability to *retrieve* what they've learned when they need to use it.

- *Meaningful learning promotes better transfer than rote learning.* Instructional time is clearly an important variable affecting transfer: The more time students spend studying a particular topic, the more likely they are to apply what they've learned on future occasions. Ideally, students should gain a *conceptual understanding* of the topic—that is, they should have the many things they've learned appropriately organized and interrelated in long-term memory. Here we see an example of the general principle *Less is more:* Students are more likely to transfer their school learning to new situations, including those beyond the classroom, when they study a few things in depth and learn them meaningfully instead of studying many topics superficially (Haskell, 2001; Linn, 2008; Schmidt & Bjork, 1992).

The *less-is-more* principle is clearly being violated in the opening case study. Ms. Gaunt decides that she must move fairly quickly if she is to cover the entire eighth-grade math curriculum, even if it means that few students will master any particular topic or procedure. Given the upcoming statewide math exam, she may have little alternative, but she's reducing the chances that her students will *use* what they're learning on future occasions.

Teach important topics in depth, with a focus on true understanding rather than rote memorization.

You have previously encountered the *less-is-more* principle in Chapter 7.

- *Both positive and negative transfer are more common when a new situation appears to be similar to a previous one.* Perceived similarity increases the chances that a new situation will provide retrieval cues that point learners in the right direction as they search long-term memory for potentially relevant knowledge and skills (Bassok, 2003; Day & Goldstone, 2012; Haskell, 2001). For instance, when Elena first encounters number words in her French class (*un, deux, trois*), the words should quickly trigger recall of similar-sounding Spanish words (*uno, dos, tres*).

  However, we should note that the similarity of two situations, although usually promoting positive transfer, can sometimes lead to negative transfer instead. To see what we mean, try the following exercise.

Experiencing Firsthand

A Division Problem

Quickly estimate an answer to this division problem:

$60 \div 0.38$

Is your answer larger or smaller than 60? If you applied your knowledge of division by whole numbers, you undoubtedly concluded that the answer is smaller than 60. In fact, the answer is approximately 158, a number much *larger* than 60. Does this exercise remind you of Ted's erroneous conclusion—that 4.14 is larger than 4.4—based on his knowledge of how whole numbers can be compared? Even at the college level, many students show negative transfer of whole-number principles to situations involving decimals and fractions (Carr, 2010; Karl & Varma, 2010; Ni & Zhou, 2005). Working with decimals appears, on the surface, to be similar to working with whole numbers. The only difference—a very important one, as it turns out—is a tiny decimal point.

To minimize the likelihood that our students *negatively* transfer some of what they've previously learned, we must be sure to point out differences between two superficially similar topics. For example, Ted's teacher might have identified some of the specific ways in which decimals are different from whole numbers. As another example, we authors find that students in our educational psychology classes often have trouble correctly understanding certain concepts (e.g., *maturation, socialization, short-term memory*) because the meanings of these words in psychology are quite different from their meanings in everyday conversation. So when we first introduce one of these concepts, we take great pains to contrast the different meanings. Even so, students' everyday meanings regularly can intrude into their thinking about course content, especially if they don't continually monitor their own thinking and understanding.

When concepts might be easily confused, explicitly point out their differences.

- *General principles and theories are more easily transferred than discrete facts and task-specific procedures.* Some knowledge of specific facts and procedures is indispensable; for example, students should know what 2 + 3 equals, where to find Africa on a globe, and how to construct a right angle. Yet by themselves, specific facts and procedures have only limited usefulness in new situations. On average, general principles, rules, and theoretical explanations are more widely applicable than isolated bits of information and how-to-do-something-specific procedures (Barnett & Ceci, 2002; Haskell, 2001; Kalyuga et al., 2010). The more we can emphasize general principles—for example, that adding two positive whole numbers always yields a larger number, that the cultures of various nations are influenced by their locations and climates, and that *cut, copy*, and *paste* functions are commonplace in computer applications—the more we facilitate students' ability to transfer what they learn. This is *not* to say, however, that we should always *begin* an instructional unit by teaching an abstract principle. Often it's better to begin with specific, concrete examples that engage students' interest and make immediate sense to them, and only later introduce the general principle at work (Nathan, 2012; Schwartz et al., 2012).

Emphasize general principles more than discrete facts, but first present concrete examples that can provide a foundation for more abstract ideas.

Especially as they get older, some students acquire an ability to apply general principles to topics quite different from those they've previously studied. For example, in one research study, fifth graders and college students were asked to develop a plan for increasing the population of bald eagles, an endangered species in their state (Bransford & Schwartz, 1999). None of the students in either age group had previously studied strategies for eagle preservation, and the plans that both groups developed were largely inadequate. Yet in the process of developing their plans, the college students addressed more sophisticated questions than the fifth graders did. In particular, the fifth graders focused on the eagles themselves (e.g., How big are they? What do they eat?), whereas the college students looked at the larger picture (e.g., What type of ecosystem supports eagles? What about predators of eagles and eagle babies?) (Bransford & Schwartz, 1999, p. 67). Thus, the college students were drawing on an important principle they had acquired in their many years of science study: Living creatures are more likely to survive and thrive when their habitat supports rather than threatens them.

The context-bound nature of some knowledge and skills learned in schools should remind you of the discussion of *situated learning and cognition* in Chapter 7.

- *Transfer is more common when information and skills are perceived as being relevant to diverse disciplines and real-world situations.* Unfortunately, many students tend to think of academic subject areas as *context bound*—that is, as being distinct disciplines that are completely separate from one another and from real-world concerns (Barnett & Ceci, 2002; Perkins & Simmons, 1988; Renkl et al., 1996). For example, when baking cookies, an 11-year-old might ask a parent, "Do two one-quarters make two fourths? I know it does in math but what about in cooking?" (Pugh & Bergin, 2005, p. 16).

The context-bound nature of some school learning may prevent students from retrieving what they've learned in situations where it might be useful. A classic study with high school students (Saljo & Wyndhamn, 1992) provides an illustration. Students were asked to figure out how much postage they should put on an envelope that had a certain weight, and they were given a table of postage rates that would enable them to determine the correct amount. When students were given the task in a social studies class, most used the postage table to find the answer. But when students were given the task in a math class, most of them ignored the postage table and tried to calculate the postage, in some cases figuring it to several decimal places. Thus, the students in the social studies class were more likely to solve the problem correctly, perhaps because they were well accustomed to looking for information in tables and charts in their social studies courses. In contrast, many of the students in the math class drew on strategies they associated with math, using formulas and performing calculations, and thus overlooked the more efficient and accurate approach.

Fortunately, not all school learning remains "stuck" in school or in a particular classroom. People often apply some skills they've probably learned at school—such as reading, arithmetic, and map interpretation—to everyday, real-world tasks. But we can *increase* the transferability of school subject matter by regularly relating it to other disciplines and to the outside world (Clark & Blake, 1997; Perkins & Salomon, 2012; Wagner, 2010), For instance, we might show students how human digestion provides a justification for categorizing food into several basic food groups, or how principles of economics have implications for addressing global climate change.

Regularly relate topics in one academic discipline to other academic disciplines and to the nonacademic world.

- *Numerous and varied opportunities for practice increase the probability of transfer.* The more that students practice using what they've learned to address new tasks and problems—and the more *diverse* those tasks and problems are—the greater the probability that students will apply school subject matter in future situations, including those outside the classroom (Gresalfi & Lester, 2009; van Merriënboer & Kirschner, 2013; Wagner, 2010). Transfer can also be promoted when students are able to practice applying newly learned skills across diverse subject areas (Anderson et al., 1996). Students who are given opportunities to transfer newly learned skills to other topics are less likely to forget the original skills that were learned (Kang et al., 2019). Especially helpful are **authentic activities**—activities similar to those that students will eventually encounter in real-world contexts. For example, when students are learning basic arithmetic principles, they might be asked to apply those principles in determining best buys at a discount store, dividing items equitably among friends, or running a book sale. Arithmetic will then be associated in long-term memory with all of these situations, and when the need arises to determine which of two purchases yields the most for the money, relevant mathematical procedures should be readily retrieved. Ideally, students should discover that much of what they learn at school truly has wide applicability—in other words, school topics become *context free* (A. Collins et al., 1989; Cox, 1997; Perkins & Salomon, 1989).

Give students many opportunities to apply classroom content to authentic, real-world tasks.

Chapter 9 discusses authentic activities in greater detail.

- *Computer simulations can also provide means of enhancing the probability of transfer.* Advances in technology have lent themselves to a wide variety of simulations with a "semi-authentic" quality. For example, children can learn a great deal about fractions with virtual "manipulatives" on a computer screen. Middle school and high school students can systematically test various hypotheses about possible causes of earthquakes or avalanches in a computer-simulated world. And high school students can become better able to critique political campaign commercials for persuasive and potentially misleading messages by creating their own commercials for, say, the U.S. presidential campaigns of Richard Nixon and Hubert Humphrey in 1968, or the campaigns of Joe Biden and Donald Trump in 2020 (Turner & Clabough, 2015; see www.livingroomcandidate.org/admaker). A particular advantage of simulations is that they can be designed in ways that keep students' cognitive load within reasonable bounds and appropriately scaffold students' efforts (Baroody et al., 2013; de Jong, 2011; Kafai & Dede, 2014; Sarama & Clements, 2009).

  A strategic search of the internet can reveal many simulations appropriate for classroom use. Following are two examples:

  - *Trail of Tears.* Middle school students can virtually experience the horrific experiences of Native Americans when, in 1838, they were forcibly removed from their fertile homelands in the southeastern United States and relocated to relatively desolate areas west of the Mississippi.
  - *KaleidoTile.* High school students can use their knowledge of geometry to create colorful, three-dimensional polyhedra.

- Realistic simulations are often both motivating and challenging—thereby keeping students on task for extended periods—and can significantly enhance students' ability to understand and apply classroom subject matter (Barab et al., 2010; de Jong, 2011; Kuhn & Pease, 2008; Tobias & Fletcher, 2011).
- *Misconceptions can be corrected and appropriately transferred to new situations.* As we discussed in Chapter 7, when students hold misconceptions (e.g., believing that dinosaurs and humans lived at the same time), those misconceptions can be

corrected by providing students with opportunities to read refutation texts. **Refutation texts** are readings that very clearly state the misperception, and also explain why the information is inaccurate. When misconceptions are cleared up by using reading materials of this nature, students will be more likely to transfer the corrected knowledge to new situations in the future (Beker et al., 2019).

- *Transfer increases when the cultural environment encourages and expects transfer.* All too often, it seems, students are encouraged to learn new content for mysterious purposes—for example, "You'll need to know this in college" or "It will come in handy later in life." Ideally, we should instead create a **culture of transfer**—a learning environment in which applying school subject matter to new situations, cross-disciplinary contexts, and real-world problems is both the expectation and the norm. For instance, we might regularly encourage students to ask themselves *How might I use this information?* as they listen, read, and study (Engle et al., 2012; Haskell, 2001; Pea, 1987; Perkins & Salomon, 2012).

Create a classroom culture in which transfer is both the expectation and the norm.

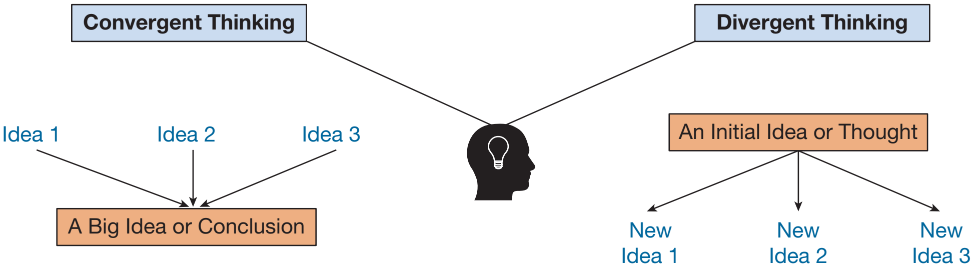
Problem Solving and Creativity

Learning Objective 8.3 **Describe several general factors that influence problem solving and creativity; also, describe teaching strategies that can encourage students to think productively and creatively as they tackle new tasks and problems.**

Both problem solving and creativity involve applying—*transferring*—previously learned knowledge or skills to a new situation. In **problem solving**, people use what they know to address a previously unanswered question or troubling situation. Psychologists have offered varying opinions about the nature of **creativity**, but in general, it involves new and original behavior that yields a product appropriate for, and in some way valued in, one's culture. Current views of creativity acknowledge that creativity is probably not a static characteristic of children that can be assessed at a specific point in time; rather, creativity is an ongoing process that develops over time as children and adolescents interact across diverse contexts (Kupers et al., 2019).

Many complex tasks and problems require *both* problem-solving skills and creative thinking. To some degree, however, problem solving and creativity differ in the extent to which they involve convergent thinking versus divergent thinking, both of which are illustrated in Figure 8.4. To successfully tackle a problem, people typically pull together two or more pieces of information into an integrated whole that resolves the problem. This combining of ideas or information into a single idea or product is known as **convergent thinking**. In contrast, when people engage in creativity, they often begin with a single idea and take it in a variety of directions, at least one of which leads to something that's new, original, and culturally appropriate. This process of generating many different ideas from a single starting point is known as **divergent thinking**. To see the difference firsthand, try the next exercise.

Figure 8.4 Convergent versus divergent thinking.



Experiencing Firsthand

Convergent and Divergent Thinking

Take a few minutes to answer each of the following questions:

1. You buy two apples for 25¢ each and one pear for 40¢. How much change will you get back from a dollar bill?
2. What are some possible uses of a brick? Generate as many different and unusual uses as you can.
3. As a teacher, you want to illustrate the idea that metal battleships float even though metal is denser (and thus heavier) than water. You don't have a toy boat made of metal. What can you use instead to demonstrate that a metal object with a hollow interior can float on water?
4. Tropical rainforests provide homes for many species of animals and plants—including some plants useful in modern medicine—and they help to reduce the rapid increase in carbon dioxide in the Earth's atmosphere. Yet each day, tens of thousands of acres of tropical rainforest disappear, largely as a result of farmers' efforts to create new farmland by slashing and burning existing vegetation. What steps might be taken to curtail this alarming rate of deforestation?

Answering Question 1 requires convergent thinking: You must pull together at least four separate things you know ($2 \times 25 = 50$, $50 + 40 = 90$, one dollar = 100 cents, and $100 - 90 = 10$) to arrive at the solution "10¢." Question 2 requires divergent thinking: You must think in many different ways about a single object, with some of your responses being novel and unique (e.g., a brick might make an interesting base for a table lamp). Questions 3 and 4 require *both* convergent and divergent thinking. To answer Question 3, you must generate a list of possible battleship substitutes (divergent thinking) and compare the alternatives in terms of their relative buoyancy and practicality for your purpose (convergent thinking). And to answer Question 4, you must pull together whatever you know about desirable habitats for various plants and animals (convergent thinking) and creatively brainstorm about possible solutions that might involve, say, teaching farmers one or more economically viable alternatives to slash-and-burn methods (divergent thinking).

Problems differ considerably in the extent to which they're clearly specified and structured. At one end of this clarity-and-structure continuum is the **well-defined problem**, in which the goal is clearly stated, all information needed to solve the problem is present, and only one correct answer exists. Calculating correct change after a purchase (Question 1) is a well-defined problem. At the other end of the continuum is the **ill-defined problem**, in which the desired goal is unclear, information needed to solve the problem may be missing, or several possible solutions may exist. Finding a suitable substitute for a metal ship (Question 3) is somewhat ill defined: Many objects might serve as a ship substitute, and some might work better than others. The rainforest destruction problem (Question 4) is even less defined: The goal (curtailing deforestation) is ambiguous, we're missing a lot of information that would help us solve the problem (e.g., What benefits might slash-and-burn practices have for farmers?), and there's no single correct solution. On average, ill-defined problems are harder to solve than well-defined ones, and they're more likely to require creative thinking.

Most problems presented in school settings are well defined. As an example, let's return to the typing problem in the opening case study:

> Clifford can type 35 words a minute. He needs to type a final copy of his English composition, which is 4,200 words long. How long will it take Clifford to type his paper?

Notice that all the information needed to solve the problem is provided, and there's no irrelevant information to lead students astray. And if Clifford continues to type at the same pace, there's only one correct answer. Yet the real world presents ill-defined problems far more often than well-defined ones, and students need practice in dealing with them. Furthermore, when students regularly encounter ill-defined problems in the school curriculum, they may acquire more sophisticated epistemic beliefs—in particular, they may begin to realize that many topics and issues don't have easy, clear-cut right and wrong answers (Rule & Bendixen, 2010).

Give students guidance and practice in dealing with ill-defined problems.

Factors Affecting Problem-Solving Success and Creative Thinking

Cognitive factors we've previously identified as affecting transfer—such as a thorough understanding of a topic and perceived relevance of new information to diverse contexts—certainly affect our students' ability to solve problems successfully and creatively. But several other factors are influential as well.

- *The depth of learners' prior knowledge influences their ability to solve problems and think creatively.* Successful problem solvers and creative thinkers usually have considerable knowledge and conceptual understanding of the topic in question (Carr, 2010; Simonton, 2000; Sweller, 2009; Woolley et al., 2019). Especially in the case of creativity, such knowledge may also involve mental associations among very different ideas and subject areas (Runco & Chand, 1995).

  When learners have limited knowledge about a topic and little conceptual understanding of it, they're apt to choose problem-solving strategies on the basis of superficial problem characteristics (Chi et al., 1981; Schoenfeld & Hermann, 1982; Walkington et al., 2012). Consider these two problems:

  - Tim has 7 apples. He gives 3 apples to Sarah. How many apples does he have left?
  - At the grocery store, Tim buys some apples for $2.00. When he leaves the store, he has $1.50 left. How much money did Tim have before he bought the apples?

Promote mastery of a subject area as one means of facilitating problem solving and creative thinking.

- The second problem requires addition, not subtraction.
- *Both convergent and divergent thinking are constrained by working memory capacity.* Remember, working memory has a limited capacity: It can hold only a few pieces of information and accommodate only so much cognitive processing at a time. If a problem requires dealing with a lot of information at once or manipulating that information in a very complex way—when the *cognitive load* is high—working memory capacity may be insufficient for effective problem processing (Lee et al., 2009; Peng et al., 2016; Sweller, 2009).

  Learners can overcome the limits of working memory in several ways. One strategy is to create an external record of needed information—for example, by putting it on paper or a computer screen. Another approach is to learn some skills to automaticity—in other words, to learn them to a point where they can be retrieved quickly and easily (Mayer & Wittrock, 2006; Rau et al., 2015; Sweller, 1994). Yet in the case of automaticity, it's possible to have too much of a good thing, as you'll see shortly. And when learners are able to think in more complex and abstract ways, they may be better able to use those more advanced cognitive skills to creatively solve problems. When students are able to find patterns, connect diverse ideas, and appreciate multiple points of view, they engage in a process known as *relational reasoning* (Dumas, 2018; Dumas et al., 2016; Green et al., 2012).

Encourage students to create an external record of important ideas related to a task or problem.

Make sure students learn basic problem-solving skills to a level of automaticity.

- *How learners encode a problem or situation influences their strategies and eventual success.* Any particular problem or situation might be represented in working memory—that is, *encoded*—in a variety of ways. As an example, see whether you can solve the problem in the following exercise.

Experiencing Firsthand

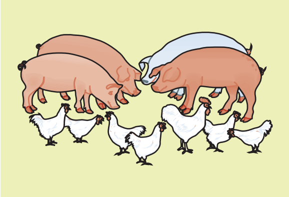
Pigs and Chickens

Try to solve this problem before you read any further:

> Old MacDonald has a barnyard full of pigs and chickens. Altogether, there are 21 heads and 60 legs in the barnyard (not counting MacDonald's own head and legs). How many pigs and how many chickens are running around the barnyard?

If you're having trouble figuring out the answer, think about the problem this way:

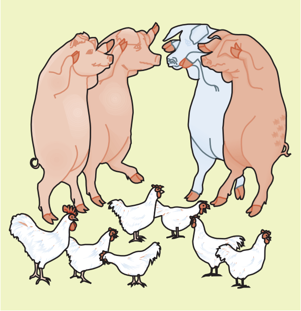
> Imagine the pigs standing upright on their two hind legs, with their two front legs raised over their heads. Therefore, both the pigs and the chickens are standing on two legs. Figure out how many legs are on the ground and how many must be in the air. From this information, can you determine the number of pigs and chickens in the barnyard?



Because there are 21 heads, there must be 21 animals. Thus there must be 42 legs on the ground (21 × 2), which leaves 18 pigs' legs in the air (60 − 42). There must therefore be 9 pigs (18 ÷ 2) and 12 chickens (21 − 9).

There are several ways you might approach the pigs-and-chickens problem. But if you initially had trouble solving it—perhaps because your algebra skills are rusty—you may have struggled to encode it in a way that led you to an easy solution. Students often have difficulty solving mathematical word problems because they don't know how to translate the problems into procedures they've studied (Lee et al., 2009; Mayer, 1992; Walkington et al., 2012).

At other times, students may encode a problem in a seemingly logical way that nevertheless fails to yield a workable result. As an example, take a stab at the next problem.

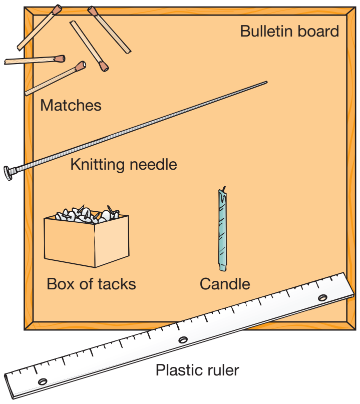


Some ways of encoding a problem enable more successful problem solving than others do.

Experiencing Firsthand

Candle Problem

How might you stand a candle upright in front of a bulletin board attached to the wall? You don't want the candle to touch the bulletin board, because the flame might singe the board. Instead, you need to place the candle about a centimeter away from the board. How can you accomplish the task using some or all of the following materials: a small candle (birthday cake size), a metal knitting needle, matches, a box of thumbtacks, and a 12-inch ruler? (Problem Based on Duncker, K. (1945). On problem solving. *Psychological Monographs, 58* [Whole No. 270].)



As it turns out, the ruler and knitting needle are useless in solving the problem. Piercing the candle with the knitting needle will probably break the candle, and you're unlikely to have much luck balancing the ruler on a few tacks. (One of us authors speaks from experience here, as some of her own students have unsuccessfully tried both strategies.) The easiest solution is to turn the thumbtack box upside down or sideways, attach it to the bulletin board with tacks, and then attach the candle to the top of the box with either a tack or melted wax. Many people don't consider this possibility because they encode the box only as a *container of tacks* and so overlook its potential use as a candle stand. When learners encode a problem in a way that limits possible solutions, they're the victims of a **mental set**.

Mental sets sometimes emerge when learners practice solving a particular kind of problem (e.g., doing subtraction problems in math or applying the formula $E = mc^2$ in physics) without also practicing other kinds of problems at the same time. Such repetitive practice can lead students to encode problems in a particular way without really thinking about them—in other words, it can lead to automaticity in encoding. Although automaticity in the basic information and skills needed for problem solving is often an advantage because it frees up working memory capacity, automaticity in *encoding* problems can lead students to solve them incorrectly (Luchins, 1942; Rohrer & Pashler, 2010; Schwartz et al., 2012).

Several teaching strategies can help students effectively encode problems without falling victim to counterproductive mental sets:

- Present problems in a concrete form; for example, provide real objects that students can manipulate, or present a visual illustration of a problem's components.
- Encourage students to make problems concrete *for themselves*; for example, encourage them to draw a picture or diagram.
- Highlight aspects of problems that students can competently solve, and when those elements appear again in a different problem, point out that the same information can be applied or the same approach to problem solution can be used (i.e., help your students to transfer what they already know to the new problem).
- Give problems that look different on the surface yet require the same or similar problem-solving procedures.
- Mix the kinds of problems that students tackle in any single practice session—an approach known as **interleaved practice**.
- Have students work in cooperative groups to identify several different ways of representing a single problem—perhaps as a formula, a table, and a graph. (Anzai, 1991; Brenner et al., 1997; Dunlosky et al., 2013; Kalyuga et al., 2010; Mayer, 1992; Prawat, 1989; Rohrer et al., 2015; Sherman & Bisanz, 2009; Turner et al., 1998)

- *Problem solving and creativity often involve heuristics that facilitate but don't guarantee successful outcomes.* Some problems can be successfully solved with an **algorithm**, a specific sequence of steps that guarantees a correct solution. For example, perhaps you've successfully put together a new bookcase by following the "Directions for Assembly" that came with all the pieces.

  Yet the world presents many problems for which no algorithms exist. There are no rules we can follow to identify a substitute battleship, no set of instructions to help us address worldwide rainforest destruction. In fact, few algorithms exist for solving problems outside the domains of mathematics and science. In the absence of an algorithm, learners must instead use a **heuristic**, a general approach that may or may not yield a successful outcome. A general heuristic that is useful in many problem-solving situations is presented in Figure 8.5. Some heuristics are specific to particular content domains. Others, such as the following, can be useful in a variety of contexts:

  - *Identify subgoals.* Break a large, complex task into two or more specific subtasks that can be more easily addressed.
  - *Represent parts of the situation on paper or a computer screen.* Make a diagram, list a problem's components, or jot down potential solutions or approaches.

Figure 8.5 A general heuristic for problem solving.

I	Identify the problem.
D	Define the problem, identifying its goals.
E	Explore and evaluate possible strategies to solve the problem.
A	Anticipate the effects of the strategies, and Act on them.
L	Look back at the effects of the strategies.

SOURCES: Bransford & Stein, 1993; Bransford et al., 1998.

  - *Draw an analogy.* Identify a situation analogous to the problem situation, and come up with potential solutions from the analogy.
  - *Brainstorm.* Generate a wide variety of possible approaches or solutions—perhaps including some that might seem outlandish or absurd—without initially evaluating any of them. After creating a lengthy list, evaluate each item for its potential relevance and usefulness.
  - *"Incubate" the situation.* Let a problem remain unresolved for a few hours or days (even longer if necessary) to allow time for a broad search of long-term memory for potentially productive approaches. (Baer & Garrett, 2010; Baird et al., 2012; Davidson & Sternberg, 1998, 2003; De Corte et al., 2010; Zhong et al., 2008)
- *Effective problem solving and creativity are partly metacognitive activities.* Metacognition plays an important role not only in effective learning and studying but also in problem solving and creativity. For example, effective problem solvers and creative thinkers tend to do many of the following:
  - Identify one or more specific goals toward which to strive
  - Break a complex problem or task into two or more simpler components
  - Plan a systematic, sequential approach to addressing each of these components
  - Continually monitor and evaluate their progress toward their goal(s)
  - Identify and address obstacles that might be impeding their progress
  - Change to new strategies if the current ones aren't working
  - Apply high standards in evaluating final results

Such metacognitive processes enable learners to use problem-solving strategies flexibly and to know when particular strategies are and are not appropriate (Carr, 2010; Csikszentmihalyi, 1996; Davidson & Sternberg, 1998; De Corte et al., 2010; Dominowski, 1998; Kirsh, 2009). In contrast, *in*effective problem solvers tend to apply problem-solving procedures mindlessly, without any real understanding of what they're doing or why they're doing it. In the opening case study, Ms. Gaunt's students rarely critique their problem solutions for logical sense; thus, they may not recognize that typing a 4,200-word paper is unlikely to take 100 days.

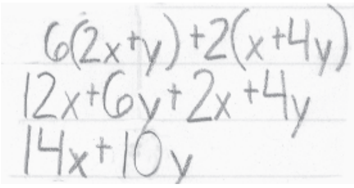
Teaching Problem-Solving Strategies

Occasionally, students develop effective problem-solving strategies on their own. For instance, many children invent simple addition and subtraction strategies long before they encounter math at school (Ginsburg et al., 2006). But without some formal instruction in effective strategies, even the most inventive students may occasionally resort to unproductive trial and error to solve problems. Following are evidence-based recommendations for teaching cognitive and metacognitive problem-solving strategies:

For Teaching Algorithms

- Describe and demonstrate specific procedures and the situations in which each can be used.
- Provide worked-out examples of algorithms being applied and ask students to explain what is happening at each step.

Figure 8.6 Thirteen-year-old Malika incorrectly simplifies the expression 6(2x + y) + 2(x + 4y) as 14x + 10y. The correct answer is 14x + 14y. Where did Malika go wrong?



$6(2x+y)+2(x+4y)$

$12x+6y+2x+4y$

$14x+10y$

Davis, Kevin

- Help students understand why particular algorithms are relevant and effective in certain situations.
- When a student's application of an algorithm yields an incorrect answer, look closely at what the student has done, and locate the trouble spot (e.g., see Figure 8.6).

For Teaching Both Algorithms and Heuristics

- Teach problem-solving strategies within the context of specific subject areas—*not* as a topic separate from academic content.
- Have students tackle problems within the context of authentic activities. For example, in **problem-based learning**, students acquire new knowledge and skills while working on a complex problem similar to one that might exist in the outside world.
- Engage in joint problem-solving activities with students, modeling effective strategies and guiding students' initial efforts.
- Provide scaffolding for difficult problems; for example, break them into smaller and simpler problems, give hints about possible strategies, or provide partial solutions.
- Have students solve especially challenging problems in pairs or small groups, in which they share ideas about strategies, model various approaches for one another, and discuss the merits of each approach.

For Teaching Metacognitive Strategies

- Ask students to explain what they're doing and why they're doing it as they work on a problem.
- Give students questions they can ask themselves as they work on a problem (e.g., "Am I getting closer to my goal?" "Why is this strategy the best one to use?").
- Help students to identify common errors in their problem solving and to check regularly for these errors.
- Ask students to reflect on their problem solutions to determine whether the solutions make sense within the context of the original problems. (Barron, 2000; Belland, 2011; Carr, 2010; Dominowski, 1998; Fuchs et al., 2016; Hmelo-Silver, 2004; Hung et al., 2008; Kapur & Bielaczyc, 2012; Kramarski & Mevarech, 2003, p. 286; Mayer, 1985; Nathan, 2012; Renkl, 2011; Retnowati et al., 2017; Rittle-Johnson, 2006; Roditi & Steinberg, 2007)

Fostering Creative Thinking

Contrary to a popular belief, creativity is *not* a single entity that people either have or don't have; it's often specific to particular situations and content areas. For example, students might show creativity in art, writing, or science but won't necessarily be creative in all of these areas.

Because creative thinking requires considerable expertise and fairly sophisticated thought processes, learners tend to become increasingly creative as they grow older, gain diverse experiences and perspectives, and have numerous opportunities to experiment with objects and ideas (Hatano & Oura, 2003; Leung et al., 2008; Simonton, 2004).

Research suggests several strategies for promoting creativity in classroom contexts:

- *Show students that creative thoughts and behaviors are valued.* One way to do this is to encourage and reward unusual ideas and responses. For example, we can assign activities that require students to generate a wide variety of ideas, and we can express excitement when students complete a project or assessment task in a unique and unusual manner. If a student comes up with a creative idea or response that is factually inaccurate, we can correct the inaccuracies, but at the same time praise the student for their creative thinking. Engaging in creative activities ourselves also shows that we value creativity (Beghetto & Kaufman, 2010; Lubart & Mouchiroud, 2003; Runco, 2004).

- *Focus students' attention on internal rather than external rewards.* Students are more creative when they engage in activities they enjoy and when they take pride in their accomplishments (American Psychological Association, 2016; Hennessey, 2010; Lubart & Mouchiroud, 2003; Perkins, 1990). To foster creativity, then, we should give students opportunities to explore their own interests—those they will gladly pursue without having to be prodded. We can also foster creativity by downplaying the importance of grades, focusing students' attention instead on the internal satisfaction their creative efforts bring. For instance, we might say this to students in an art class:

  > Please don't worry about grades. As long as you use the materials appropriately and give each assignment your best effort, you will do well in this class. The important thing is to find an art form that you enjoy and through which you can express your perceptions and feelings.

Such a statement is intended to encourage *intrinsic motivation*, a concept discussed in depth in Chapter 10.

- *Ask thought-provoking questions.* Students are more likely to think creatively when we pose **higher-level questions**—questions that require them to use previously learned information in new ways. Questions that require divergent thinking can be especially helpful (Perkins, 1990; Sternberg, 2010). For example, in history lessons we might ask questions such as these:
  - *In a lesson on the Pony Express as a method of U.S. mail delivery in the 1860s:* "In what different ways might people have carried mail across the country at that time?" (Feldhusen & Treffinger, 1980)
  - *In a lesson on Angkor Wat, an enormous stone temple complex built in the 12th century in what is now Cambodia:* "How might the Khmer people have built these temples using massive blocks (400 pounds each) with no cement?" (Courtesy of Jeffrey Ormrod)
- *Teach and encourage cognitive and metacognitive strategies that support creative thinking*. Explicit instruction in using some of the strategies that creativity requires can enhance creativity (Hattie, 2009). Examples of such strategies include:
  - Brainstorming ideas, perhaps in collaboration with peers; deferring judgment until after a lengthy list has been generated
  - Focusing attention on gradual progress toward a goal, rather than expecting an immediate solution
  - Identifying and addressing specific obstacles that may be impeding progress (Beghetto & Kaufman, 2010)
- *Give students the freedom and security they need to take risks.* To be creative, students must be willing to take risks—something they're unlikely to do if they're afraid of failing (Houtz, 1990; Sternberg, 2010). To encourage risk taking, we can allow students to engage in certain activities without evaluating their performance. For example, in response to the question presented earlier about how 12th-century Khmer people might have built large stone temples at Angkor Wat, a middle school student at an English-speaking school in Thailand was quite creative in his response, as his teacher reported:

  > Several students drew a long wooden ramp on which they would drag the giant blocks. I asked them what would probably happen as soon as they started dragging the block up this ramp (i.e., the block would break the ramp and come crashing down). So one student drew poles under his ramp to support it. I pointed out that this would work only at very low levels because the trees in the area were small and weak. His next idea was to use wood and bamboo to make the ramp stronger, but I suggested that the structure still wouldn't be strong enough to bear the load. He came back a few minutes later with another idea. He still had the ramp, but underneath it for support he had drawn in a few elephants. I urged him to reflect on his new idea: "Even if you can get the elephants to stand still and put a ramp on their backs, elephants are only about this tall. [I showed their height with my hand.] Angkor Wat is 213 feet tall. How are you going to support the ramp between about 6 feet and 213 feet?" His

> response was to stack the elephants on top of each other. (Example courtesy of Jeffrey Ormrod. Copyright © by Jeffrey Ormrod. Reprinted by permission.)

Granted, the student's ultimate solution wasn't realistic, but he was definitely thinking in an innovative, divergent manner—"outside the box"—and his teacher had created a classroom atmosphere in which he felt comfortable doing so.

We can further encourage risk taking by urging students to think of their mistakes and failures as an inevitable—but usually temporary—aspect of the creative process (Hennessey & Amabile, 1987; Kaufman & Beghetto, 2009). For example, when students are writing a short story, we might give them several opportunities to get our feedback and perhaps also the feedback of their peers before they turn in a final product.

- *Provide the time and resources that creativity requires.* Students need time to experiment with new materials and ideas, engage in divergent thinking, and make mistakes. Our students usually can be more creative if they have a variety of physical and social resources on which to draw—perhaps paper and pencil, software, internet access, ample space in which to work, and the ideas and support of classmates. Occasional gentle guidance from a teacher can also boost creative thinking (Beghetto & Kaufman, 2010).

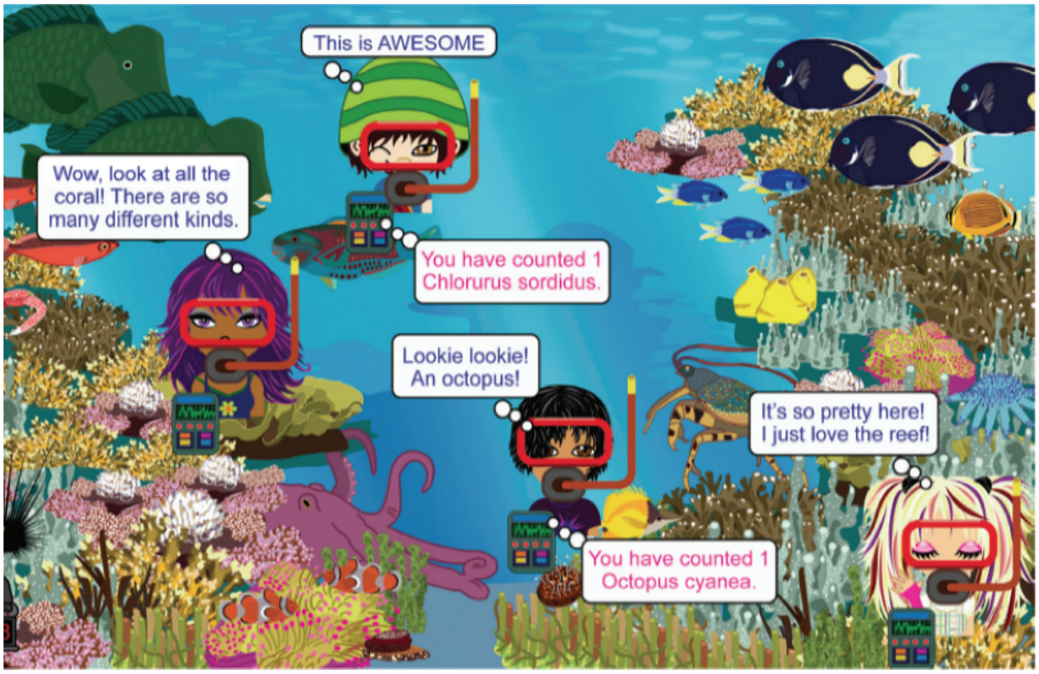
Using Computer Technology to Foster and Support Creative Problem-Solving

The strategies we've considered thus far have been predominantly "low tech." But we can also capitalize on technology to foster problem-solving skills and, often, creative thinking skills as well. Following are several possibilities:

- Show students how to use spreadsheets and graphing programs to manipulate and analyze data.
- Use computer-based **intelligent tutoring systems**—software that provides individualized instruction and guidance related to a particular topic and set of skills—to teach mathematical and scientific reasoning and problem solving (e.g., see Figure 8.7).
- Use computer simulations that allow students to formulate hypotheses, design experiments to test the hypotheses, and interpret the virtual results.
- When possible, encourage students to work collaboratively with technology (e.g., solving problems in small groups).
- Present simulated real-world–like problems (i.e., authentic activities) that students must solve. (Beal et al., 2010; Belland et al., 2017; Davis et al., 2018; Kuhn & Dean, 2005; Kulik & Fletcher, 2016; VanLehn, 2011; Ward et al., 2013)

Some simulations immerse students in three-dimensional virtual "environments" that present real-world–like tasks and problems they need to address. For instance, students might "live" in societies in which they have to make complex decisions related to engineering, farming, or city planning. In some cases, technology-based simulations have a distinctly game-like nature, often involving considerable interaction with peers. Despite their obvious element of play, video games and other high-tech games that are specifically designed to engage students in academic subject matter can foster significant improvements in students' learning and achievement (Clark et al., 2016; Plass et al. 2015; Tobias & Fletcher, 2011). As an illustration, in an Internet-based game site called "Whyville" (www.whyville.net), students become "citizens" who enter, explore, experiment, compete, and collaborate in a colorful, multifaceted virtual world with its own government, economy, and ecosystem. For example, after creating personal avatars, "Whyvillians" can earn "clams" (Whyville's virtual currency) and contribute to their community's collective knowledge and well-being by building energy-efficient homes, developing a new vaccine, creating a community recycling program, or identifying new species in a local coral reef (see Figure 8.7). In such a virtual environment, students not only learn and apply academic subject matter but also practice prosocial strategies and leadership skills (Kafai & Fields, 2013; Tobias & Fletcher, 2011; Wouters et al., 2013).

Figure 8.7 In this screenshot from Whyville, students' avatars encounter a variety of coral reef species as they scuba dive in a virtual coral reef. By identifying and counting these organisms, students learn about the reef ecosystem and keep track of the health of the reef. For more information, go to reef.whyville.net. (Screenshot provided courtesy of Numedeon, Inc. the creators of Whyville. Copyright © by Numedeon, Inc. Reprinted by permission.)



This is AWESOME

Wow, look at all the coral! There are so many different kinds.

You have counted 1 Chlorurus sordidus.

Lookie lookie! An octopus!

It's so pretty here! I just love the reef!

You have counted 1 Octopus cyanea.

Ideally, students should reflect on and carefully evaluate the results of their problem-solving efforts and creative endeavors. In other words, they should also engage in critical thinking—our next topic.

Critical Thinking

Learning Objective 8.4 Identify several different forms that critical thinking might take, and explain how you can help students critically evaluate what they see, hear, and read both inside and outside the classroom.

You have undoubtedly heard of "critical thinking," and you have probably heard that it is important for students to become critical thinkers. The following exercise explores the nature of critical thinking.

Experiencing Firsthand

Critical Thinking

Have you ever "critically thought" about critical thinking? Try answering the following questions before reading further:

1. How would you define critical thinking (in one or two sentences)?
2. Imagine that you are teaching a lesson on theories about the causes of the Covid-19 pandemic, and you wanted to encourage your students to be critical thinkers. How would you do this? What specifically would you ask your students to do?
3. Now imagine that you are teaching a math lesson about area. After you teach your students how to calculate the area of squares and rectangles, you want them to try to figure out how one might calculate the area of a triangle. Rather than telling them the formula, you want them to engage in critical thinking to figure this out. What specifically would you encourage your students to do?
4. Now compare your responses to questions 1, 2, and 3 with another student in this class.

Did you and other students all define critical thinking in the same way (question 1)? Did the strategies that you suggested (to promote critical thinking) differ for questions 2 and 3? Most people, when pushed to define critical thinking, have many different ideas about what it is (and what it isn't). And you probably observed that the ways you would encourage critical thinking are quite different depending on the content that you are teaching.

The point of this exercise was to demonstrate to you that "critical thinking" is one of those phrases that is used quite often but means different things to different people. Theorists also define critical thinking somewhat differently, but for our purposes here, we'll define **critical thinking** as evaluating the accuracy, credibility, and worth of information and lines of reasoning. Critical thinking is reflective, logical, and evidence based. It also has a purposeful quality to it—that is, the learner thinks critically in order to achieve a particular goal.

Critical thinking can take a variety of forms, depending on the context. The following exercise presents three possibilities.

Experiencing Firsthand

Colds, Chance, and Cheer

Read and respond to each of the following situations:

1. It's autumn, and the days are becoming increasingly chilly. You see the following advertisement online:

   > Aren't you tired of sniffles and runny noses all winter? Tired of always feeling less than your best? Get through a whole winter without colds. Take Eradicold Pills as directed. (Harris, 1977, p. 605)
   >
   > Should you go out and buy a box of Eradicold Pills?

2. You have been rolling a typical six-sided die (i.e., one member of a pair of dice) for the past several minutes. You know that the die isn't loaded—it's not heavier on one side than another—yet in the past 30 rolls you haven't rolled a number 4 even once. What are the odds that you'll get a 4 on the next roll?
3. In a research article published in the widely respected journal *Psychological Science*, researchers reported several correlations between parenthood and psychological well-being: Adults who have children tend to be happier—and to find more meaning in life—than adults who don't have children (Nelson et al., 2013). Does this mean that becoming a parent leads to greater psychological well-being?

In each situation, you had to evaluate information and make some sort of judgment. In Item 1, we authors hope you weren't tempted to buy Eradicold Pills, because the ad provided no proof that they reduce cold symptoms. It simply included the suggestion to "Take Eradicold Pills as directed" within the context of a discussion of undesirable symptoms—a common ploy in persuasive advertising.

In Item 2, the chance of rolling a 4 on an evenly balanced die is—as always—one in six. The outcomes of previous rolls are irrelevant, because each roll is independent of the others. But when a 4 hasn't shown up even once in 30 rolls, many people believe that a 4 is long overdue and so greatly overestimate its probability—a misconception known as the *gambler's fallacy*.

What about the possibility that becoming a parent leads to greater psychological well-being (Item 3)? The words "leads to" imply a cause-and-effect relationship. One common mistake people make in interpreting research results is to think that an association (correlation) between two things means that one of those things must *cause* the other. Having children might be a source of happiness, but maybe, instead, happier people are more likely to *want* children in their lives. Alternatively, perhaps a third factor—for instance, general social and economic well-being—results in *both* personal happiness and a desire to have children. Given the data collected in Nelson and colleagues' study, there's no way to know for sure what causes what, nor did these researchers make any claims about cause-and-effect relationships.

The three situations just presented illustrate three different forms that critical thinking might take (e.g., Halpern, 1997, 2008):

- *Verbal reasoning:* Understanding and evaluating persuasive techniques found in oral and written language. You engaged in verbal reasoning when deciding whether to purchase Eradicold Pills.
- *Probabilistic reasoning:* Determining the likelihood and uncertainties associated with various events. You engaged in probabilistic reasoning when you determined the probability of rolling a 4 on the die.
- *Scientific reasoning:* Judging the value of data and research results in terms of the methods used to obtain them and their potential relevance to certain conclusions. For instance, it involves pondering questions such as these:
    - Was an appropriate method used to measure a particular outcome?
    - Were the data analysis techniques appropriate for the question?
    - Have other possible explanations or conclusions been eliminated?
    - Can the results obtained in one situation be reasonably generalized to other situations?

We authors are hoping that you engaged in scientific reasoning when you evaluated the study about happiness and having children.

The specific nature of critical thinking can vary considerably depending on the subject area. In writing, it might involve reading the first draft of a persuasive essay to look for errors in logical reasoning or for opinions that haven't been sufficiently justified. In science, it might involve revising existing theories or beliefs to account for new evidence—that is, it might involve conceptual change. In history, it might involve drawing inferences from historical documents, attempting to determine whether things *definitely* happened a particular way or only *possibly* happened that way; for instance, it might entail distinguishing between relatively objective documents (such as census data) and potentially biased accounts of events (e.g., newspaper articles and personal diaries).

In many content domains, a key component of critical thinking is **argument analysis**—a close examination and evaluation of reasons (*arguments*) that do and don't support a particular conclusion (e.g., Goldman et al., 2016; Mercier et al., 2017; Nussbaum, 2008). Solid arguments tend to be in the form of credible evidence, logical and defensible reasoning, or some combination of the two.

As you might guess, critical thinking skills emerge gradually over the course of childhood and adolescence (Amsterlaw, 2006; Kuhn & Franklin, 2006; Sandoval et al., 2014). Yet all too often, students at all grade levels—and even many well-educated adults—take the information they see in textbooks, news reports, websites, and elsewhere at face value. You probably have heard (and maybe used) the expression, "I'll google that." Information is readily and instantly available via free search engines such as Google, Yahoo, and others. But the information found via those search engines isn't guaranteed to be accurate. Virtually anyone can post personal beliefs and opinions on the internet—often presenting these things as irrefutable "facts"—and it's quite easy for others both to be taken in and to "share" dubious posts with like-minded individuals in cyberspace. Many students at all grade levels—even many college students—naively assume that almost everything they read on the internet is fact (Manning et al. 2011; Metzger et al., 2003; Wiley et al., 2009). Moreover, many students engage in little or no critical thinking as they consider the accuracy, credibility, and worth of the information they encounter (Kuhn, 2009; Marcus, 2008; Metzger et al., 2003; Sinatra et al., 2014).

Learners' tendency to think or not think critically depends, in part, on their personality characteristics: On average, critical thinkers are open-minded, enjoy intellectual challenges, and can emotionally handle the idea that they might occasionally be wrong about a topic (Halpern, 2008; Pennycook et al., 2015; West et al., 2008). Learners' epistemic beliefs come into play as well. Learners are more likely to look analytically and critically at new information if they believe that even experts' understanding of a topic continues to evolve as new evidence accumulates. They're *less* likely to engage in critical thinking if they believe that knowledge is an absolute, unchanging entity (King & Kitchener, 2002; Kuhn, 2001; Muis & Franco, 2009).

Let's face it: Critical thinking requires considerable mental effort. Given the many little challenges that we encounter in our daily 21st-century lives, all of us are apt to take logical shortcuts once in a while (Kahneman & Tversky, 1996; Kaku, 2014; Stanovich, 2016). For example, we might accept certain claims as being "true" simply because:

- We've heard those claims made many times before
- The claims are consistent with our prior beliefs about a topic
- The claims are made by family members, close friends, or people who present themselves as self-confident and knowledgeable "experts"
- The claims intertwine accurate information with inaccuracies and logical fallacies
- The claims provide quick-and-easy "right" solutions to complex and controversial problems (Asterhan & Schwarz, 2016; Rapp, 2016; Schwarz & Newman, 2017; Sinatra & Hofer, 2021; Stanovich et al., 2012)

The bottom line is that many of us can be cognitively "lazy" with alarming frequency (Mercier et al., 2017).

Encouraging Critical Thinking in the Classroom, the Outside World, and Cyberspace

To become effective lifelong learners, students must learn that not all sources of information can be trusted—that some messages presented through various media are either misleading or blatantly wrong. Perhaps because critical thinking encompasses such a variety of cognitive skills, strategies for encouraging it are many and varied. Some of the factors that promote metacognition, transfer, and problem solving are applicable to teaching critical thinking as well. Embedding thinking-skills instruction within the context of specific academic disciplines, collaborative group tasks, and authentic activities can help learners think more critically. Following are more specific theory-based and evidence-based recommendations:

Teach and encourage critical thinking skills in diverse disciplines across the school curriculum.

- Teach fewer topics, but in greater depth—the *less-is-more* principle once again.
- Encourage some intellectual skepticism—for instance, by urging students to question and challenge the ideas they read and hear—and communicate the epistemic belief that people's knowledge and understanding of any single topic may continue to change over time.
- Overtly model critical thinking—for instance, by thinking aloud while analyzing a persuasive argument or scientific report.
- Give students many opportunities to practice critical thinking—for instance, by identifying flaws in the arguments of a persuasive essay, evaluating the quality and usefulness of a scientific report, and using evidence and logic to support a particular viewpoint. In some instances, allow students to correct their thinking (without experiencing a penalty like a bad grade on an assignment).
- Have students debate controversial issues from several perspectives, and occasionally ask them to defend a perspective quite different from their own.

- Encourage students to try to produce multiple solutions when possible. Examples can be helpful, but sometimes asking students to suggest solutions before providing an example may promote greater critical thinking.
- Help students understand that critical thinking involves considerable mental effort but that its benefits make the effort worthwhile.
- Embed critical thinking skills within the context of authentic, real-world problems and issues as a way of helping students retrieve those skills later, both in the workplace and in other aspects of adult life.
- Occasionally require the use of critical thinking in classroom assessment tasks. (Afflerbach & Cho, 2010; Bonney & Sternberg, 2011; de Chantal et al., 2020; Halpern, 1998; Heyman, 2008; Kuhn, 2015; Monte-Sano, 2008; Moon, 2008; Nussbaum, 2008; Nussbaum & Edwards, 2011; Rapp, 2016; Sandoval et al., 2014; Schraw & Robinson, 2011; Wissinger & De La Paz, 2016)

We might also ask students to consider questions such as these when reading printed materials or searching for information from the internet:

- Who produced this document/website? Does the author have well-substantiated (as opposed to self-proclaimed) expertise about the topic? What biases or predispositions might the author have?
- What persuasive technique is the author using? Is it valid, or is it designed to mislead the reader?
- What assumptions underlie the assertions and arguments presented?
- What evidence and/or reasons support the conclusion? What evidence and/or reasons *don't* support it?
- Is the information consistent with what you've learned from other sources? If not, in what ways is it different? How might you reconcile the inconsistencies?
- What actions might you take to improve the design of this study? (Questions based on suggestions by De La Paz & Felton, 2010; Halpern, 1998; Stahl & Shanahan, 2004; Wiley et al., 2009)

The Into the Classroom feature "Fostering Critical Thinking" presents examples of what teachers might do in various content domains. In this age of widespread access to multiple sources of information—some legitimate, some of questionable value, and some completely bogus—critical thinking skills are now more *critical* than ever.

Into the Classroom

Fostering Critical Thinking

- **Teach elements of critical thinking.**

  In a unit on persuasion and argumentation, a middle school language arts teacher explains that a sound argument meets three criteria: (a) The evidence presented to justify the argument is accurate and consistent; (b) the evidence is relevant to and provides sufficient support for the conclusion; and (c) little or no information has been omitted that, if present, would lead to a contradictory conclusion. The teacher then has students practice applying these criteria to a variety of persuasive and argumentative essays.

- **Foster epistemic beliefs that encourage critical thinking.**

  Rather than teaching history as a collection of facts to be memorized, a high school history teacher portrays the discipline as an attempt by informed but inevitably biased scholars to interpret and make sense of historical events. On several occasions he asks his students to read two or three different historians' accounts of the same incident and look for evidence of personal or political bias in each.

- **Teach students skills for effectively presenting and evaluating arguments for various opinions on a controversial topic.**

  Students in a second-grade class read Shel Silverstein's *The Giving Tree*, a children's book in which a boy and an apple tree form a friendship. Throughout his childhood, the boy in the story regularly plays in the tree and eats her apples. As he grows older, his desires grow more sophisticated and he gradually takes parts of the tree—first all of her apples, then all of her branches, and finally her trunk, at which point only a small stump remains. After reading the book, the teacher scaffolds a discussion about whether the boy's actions were ethically appropriate. Initially, each student is asked to state an opinion on the matter. The students are then asked four questions:

- Why do you agree with that side?
- Can you be sure that you are right?
- Is it possible you could learn something new that would make you change your mind?
- What would someone from the other side say if they were trying to convince you that they were right?

Embed critical thinking skills within the context of authentic activities.

In a unit on statistical and scientific reasoning, an eighth-grade science class studies concepts related to probability, correlation, and experimental control. Then, as part of a simulated legislative hearing, the students work in small groups to develop arguments for or against a bill concerning the marketing and use of vitamins and other dietary supplements. To find evidence to support their arguments, the students apply what they've learned about statistics and experimentation as they read journal articles and government reports regarding the possible benefits and drawbacks of nutritional supplements.

Teach students how to evaluate the accuracy of information posted on the internet.

On an educational website called "All About Explorers," elementary students practice distinguishing between credible and questionable information while searching for facts about well-known early explorers. For example, as students look for information about Christopher Columbus, they visit a bogus "website" that describes Columbus as having been born in 1951 but dying in 1906—a timeline that obviously makes no sense—and asserts that he made an appearance on a TV talk show. (As this book goes to press, you can find this teacher-created website at allaboutexplorers.com.)

Especially at the middle school and high school levels, alert students to the fact that some sources of information constitute "fake news."

A high school teacher asks students to scrutinize and critically evaluate professionally created websites that have specifically been designed to mislead the public about controversial issues, including sites authored by organized lobbyists with very self-serving interests.

SOURCES: Derry et al., 1998 (statistics example based on this study); Halpern, 1997 (criteria for a sound argument); Paxton, 1999 (bias in history example); Walker et al., 2013, p. 1340 (*Giving Tree* example); Wineburg et al., 2016 ("fake news" example).

Self-Regulation

Learning Objective 8.5 **Identify important components of self-regulated behavior and self-regulated learning, and apply your knowledge of self-regulation to help diverse learners effectively control their behavior, master academic subject matter, and address interpersonal problems.**

So far in this chapter, we have been talking about various higher order cognitive processes, including strategy use, transfer, and problem solving. But we haven't discussed in detail the ways in which students actually use these various cognitive processes. **Self-regulation** refers to the processes by which students intentionally apply, monitor, and evaluate these processes during learning. It isn't enough for learners to realize that they need to study *more* or *better* to address their gaps in understanding and achieve at high levels. They must also know how to get themselves in motion to *follow through* with further study—for instance, by setting aside particular times for studying, seeking any needed resources and assistance, and minimizing distracting stimuli (Roelle et al., 2017; Sussan & Son, 2014). To get a sense of your own self-regulation skills, try the following exercise on page 315.

Regardless of how you answered Item 1, you could probably identify a particular goal toward which you're striving. Your response to Item 2 should give you an idea of how much you monitor and try to control your thoughts when you're studying. Your responses to Items 3 and 4 tell you something about how frequently and accurately you evaluate your performance. And your response to Item 5 indicates whether you're likely to reinforce yourself for desired behaviors. To the extent that we establish our own priorities and goals, take charge of our own thoughts and actions, and reflect on and evaluate our own behaviors, we are self-regulating individuals (e.g., Bandura, 2008).

Thanks, in part, to brain maturation, most learners become increasingly self-regulating as they grow older (more on this point in an Applying Brain Research feature later in the chapter). Table 8.3 on the next page presents typical advancements in the elementary and

DEVELOPMENTAL TRENDS

Table 8.3 Self-Regulation at Different Grade Levels

Grade Level	Age-Typical Characteristics	Example	Suggested Strategies
Preschool	Variation in acquisition of behavioral self-regulation during the preschool years; some children become highly self-regulatory by the time they enter kindergarten, but others do not. It generally takes about 2–3 years for these skills to develop, and they develop rapidly once they emerge.	Three-year old Adam comes to realize that sometimes he plays too aggressively with his friends on the playground.	Utilize curricula that are designed to help children practice self-regulatory skills.
K–2	• Some internalization of adults' standards for behavior • Emerging ability to set self-chosen goals and to self-evaluate actions • Some use of self-instructions (self-talk) to guide behavior • Individual differences in self-control of impulses, emotions, and attention	Most of the children in kindergarten can sit quietly and listen when their teacher reads a story, but a few squirm restlessly and occasionally distract their classmates.	🍏 Discuss rationale for classroom rules. 🍏 Show students how some behaviors can help them reach their goals and others may interfere. 🍏 Organize the classroom so that students can carry out some activities on their own. 🍏 When students show poor control of emotions, provide guidelines and consistent consequences for behavior. 🍏 Teach students how to reappraise academic tasks that might cause anxiety in more positive terms.
3–5	• Improving ability to self-assess progress • Feeling guilt and shame about unsatisfactory performance and moral transgressions • Emerging self-regulated learning strategies (e.g., conscious attempts to focus attention) • Persistent difficulties with self-control for some students	Every Thursday evening, 8-year-old Logan studies for the weekly spelling test his teacher will give the following day. Sometimes he asks his father to test him on difficult words.	🍏 Help students set specific, concrete, attainable goals. 🍏 Encourage students to assess their performance; provide criteria they can use to evaluate their work. 🍏 Ask students to engage in simple, self-regulated learning tasks (e.g., short homework assignments); provide some structure to guide students' efforts. 🍏 Encourage students to use their peers as resources when they need help. 🍏 If students have continuing difficulty with self-control, teach self-instructions that can help them control behavior.
6–8	• Increasing ability to plan future actions • Increasing mastery of some self-regulating learning strategies, especially those that involve overt behaviors (e.g., keeping a calendar of assignments and due dates) • Self-motivational strategies (e.g., minimizing distractions) • Decrease in help-seeking behaviors during times of confusion, especially if teachers appear to be non-supportive	When Marie starts middle school, she asks her parents to buy her a planner, because she wants to keep track of assignments and also plan for tests and quizzes.	🍏 Assign homework and other tasks that require age-appropriate independent learning. 🍏 Provide concrete strategies for keeping track of tasks and assignments (e.g., provide calendars on which students can write due dates). 🍏 Provide concrete guidance and examples about how to study effectively. 🍏 Give students opportunities to assess their own learning; have them compare your evaluations with theirs.
9–12	• More long-range goal setting • Continuing development of strategies for emotion regulation, especially in contexts that can evoke strong emotions (e.g., sports) • Wide variability in ability to self-regulate learning, especially when out-of-school assignments conflict with leisure activities; few self-regulating learning strategies among many low-achieving students • For a small number of older adolescents, persistent difficulties in self-control	After moving from fairly small middle schools to a much larger high school, some students diligently complete their homework each night, but others are easily enticed into more enjoyable activities with friends, and their grades decline as a result.	🍏 Relate learning tasks to students' long-range personal and professional goals. 🍏 Encourage students to experiment with various emotion-control strategies through role-playing. 🍏 Assign complex independent learning tasks, providing the necessary structure and guidance for students who are not yet self-regulated learners.

SOURCES: Abrami et al., 2013; Bronson, 2000; Brunstein & Glaser, 2011; Corno & Mandinach, 2004; Damon, 1988; Dunning et al., 2004; Eccles et al., 1998; Fries et al., 2008; Hampson, 2008; Hofer, 2010; Jones et al., 2008; Kochanska et al., 2002; Larson & Brown, 2007; Lonigan et al., 2017; Losenno et al., 2020; Marchand & Skinner, 2007; Matthews et al., 2009;; Meltzer et al., 2007; Miller et al., 2003; Paris & Paris, 2001; Posner & Rothbart, 2007; Schneider, 2010; Valiente et al., 2008; Wolters & Rosenthal, 2000.

Experiencing Firsthand

Self-Reflection about Self-Regulation

For each of the following situations, choose the alternative that most accurately describes your attitudes, thoughts, and behaviors as a college student. No one will see your answers except you, so be honest!

1. With regard to my final course grades, I'm trying very hard to

- **a.** Earn all As.
- **b.** Earn all As and Bs.
- **c.** Keep my overall grade point average at or above the minimally acceptable level at my college.

2. As I'm reading or studying a textbook,

- **a.** I often notice when my attention is wandering, and I immediately get my mind back on my work.
- **b.** I sometimes notice when my attention is wandering, but not always.
- **c.** I often get so lost in daydreams that I waste a lot of time.

3. Whenever I finish a study session,

- **a.** I write down how much time I've spent on my schoolwork.
- **b.** I make a mental note of how much time I've spent on my schoolwork.
- **c.** I don't really think much about the time I've spent on my schoolwork.

4. When I turn in an assignment,

- **a.** I usually have a good idea of the grade I'll get on it.
- **b.** I'm often surprised by the grade I get.
- **c.** I don't think much about the quality of what I've done.

5. When I do exceptionally well on an assignment,

- **a.** I feel good about my performance and might reward myself in some way.
- **b.** I feel good about my performance but don't do anything special for myself afterward.
- **c.** I don't feel much different than I did before I received my grade.

secondary school years. Some of the entries in the table, such as self-instructions and self-evaluation of actions, reflect self-regulation in *behavior*; others, such as ability to control attention and self-motivation, reflect self-regulation in *learning*. We'll look here at both self-regulated behavior and self-regulated learning, as well as at self-regulated problem solving.

Self-Regulated Behavior

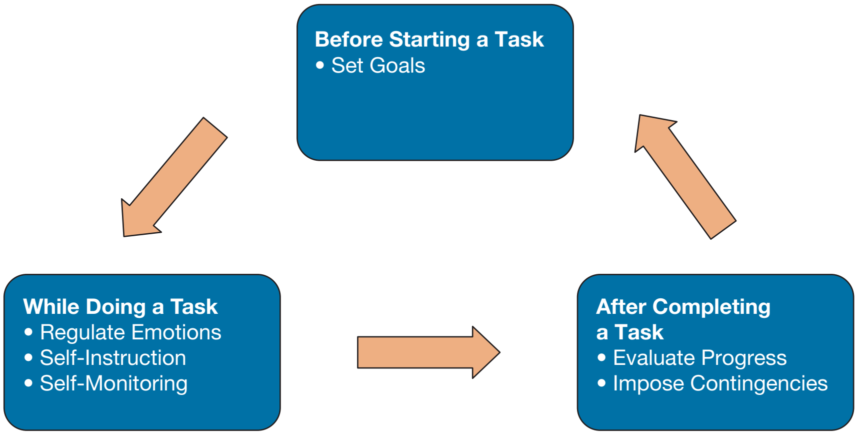
Self-regulation is a broad term that actually refers to several related behaviors. In order to help our students become self-regulated learners, it's best to first note that different self-regulated behaviors occur at different times during the learning process. Some occur *before* a student begins a task, some occur *while* the student is engaged with the task, and some occur *after* the student has completed the task. The overarching model of self-regulation that we will use to guide our discussion is displayed in Figure 8.8.

Self-Regulated Behaviors Before Starting a Task

Self-Determined Standards and Setting Goals When a student is given an academic task or assignment to work on, one of the first things they might do is to set goals for how they will approach and complete the task. Learners set these goals based on general standards for behavior—standards that serve as criteria for evaluating their performance in specific situations. When students meet standards and accomplish their goals, they usually feel considerable self-satisfaction, and will feel even more confident in engaging in similar tasks in the future (Bandura, 1986, 2008).

Different individuals adopt different standards and goals for themselves, of course. Often their standards and goals are modeled after those of other people (Fitzsimmons & Finkel, 2010; Locke & Latham, 1990; Miller & Brickman, 2004). For example, at some high schools, there are many students who want to go to the best college they possibly

Figure 8.8 Components of self-regulated behavior.



can, and their academic aspirations are contagious. But at a different high school, getting a job after graduation—or perhaps *instead* of graduation—might be the goal more commonly modeled by peers.

Students are typically more motivated to work toward goals they've chosen for themselves, rather than goals that others have imposed on them (e.g., Deci & Ryan, 1992; Fitzsimmons & Finkel, 2010; Ford, 1992). One way to help students develop self-regulation, then, is to provide situations in which they set their own goals. For example, we might ask them to decide how many addition facts they're going to learn by Friday, or which gymnastic skills they'd like to master.

Ideally, we should encourage students to establish standards and goals that are somewhat challenging yet realistic. Try the following exercise.

Experiencing Firsthand

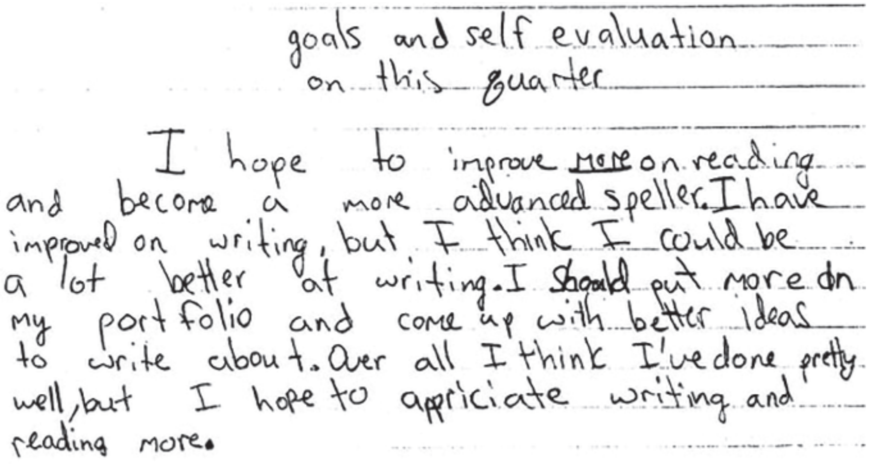
Setting Goals

Suppose you decide to go on a diet, with the goal of losing 50 pounds within one year. You adhere to your diet, and at the end of one week, you weigh yourself, and find that you have lost one pound. You then continue to adhere to the diet, and you weigh yourself at the end of the second week, and you lost another pound. How do you feel about your success in reaching your goal of losing 50 pounds?

Now let's "reset" and start the hypothetical diet over. Instead of setting the goal of losing 50 pounds in one year, let's say that you set the goal of just losing one pound per week. You weigh yourself at the end of the first week, and you have lost one pound; you weigh yourself at the end of the second week, and you have lost another pound. How do you feel about your success in reaching your goal of losing one pound per week?

Most of you probably felt better about your success in the second scenario. But really, the only difference is the type of goal that was set. In the first example, the goal was focused on a long-term outcome (i.e., one that is a year away), whereas in the second example, the goal was focused on a short-term outcome (i.e., one that is one week away). The shorter-term goal is a proximal goal. **Proximal goals** are short-term

Figure 8.9 A middle school student's reading and writing goals.



goals and self evaluation
on this quarter

I hope to improve more on reading
and become a more advanced speller. I have
improved on writing, but I think I could be
a lot better at writing. I should put more on
my portfolio and come up with better ideas
to write about. Over all I think I've done pretty
well, but I hope to appriciate writing and
reading more.

goals that are achievable in a brief amount of time, either independently or with some support. In contrast, longer-term goals are referred to as **distal goals**. When students pursue and accomplish proximal goals, they experience feelings of success; when students continue to succeed at short-term (proximal) goals, they are more likely to ultimately achieve their long-term (distal) goals (Schunk, 1983). The note presented in Figure 8.9 is a middle school student's description of some goals that he can set as he moves toward trying to become a better reader. As you can probably see, these are rather vague, distal goals; his teacher could use this as an opportunity to support these long-term goals, but also help him to set some short-term, reachable goals (e.g., "I'll write one paragraph each night for the next two weeks, and I'll ask for feedback on the paragraph each day from my teacher").

Students who are highly confident about their abilities in a particular subject area (e.g., reading) will be more likely to set the goal of getting a good grade in that subject; that goal often will encourage them to use self-regulatory strategies, which ultimately should lead to higher achievement (Lee et al., 2014). At the same time, we must caution students that constant perfection is *not* a realistic goal—that occasional errors are inevitable in the pursuit of new and difficult tasks. Students who are satisfied only with flawless performance can't possibly live up to such an impossible standard and, as a result, may become excessively anxious or depressed (Bandura, 1986; Covington, 1992; Stoeber et al., 2014).

Self-chosen rather than other-chosen goals enhance one's sense of self-determination, an important prerequisite for intrinsic motivation (see Chapter 10).

Self-Regulated Behaviors While Doing a Task

Emotion Regulation There are several self-regulation behaviors that occur while a student is doing a task. One of these is **emotion regulation**—the keeping in check or modifying of any feelings that might lead to counterproductive responses—perhaps anger, resentment, or excessive excitement. Effective emotion regulation often involves a two-pronged approach (Buckley & Saarni, 2009; Pekrun, 2006; Richards, 2004). First, learners control the extent to which they *express their feelings.* In addition, self-regulating individuals often *reinterpret events* in order to put a positive spin on what might otherwise be anger- or sadness-inducing circumstances. For instance, a student who gets an unexpectedly low quiz score might treat it as a wake-up call to study more diligently in the future. And a student who doesn't make the varsity soccer team might think, "Maybe this is a blessing in disguise, because it gives me more time to help out at the Boys' Club after school." Children can be taught to reappraise events when they are quite young (e.g., in kindergarten); thus, children who are consistently taught and reminded how to reinterpret potentially anxiety-provoking situations at school may learn early on how to avoid such negative affect (Losenno et al., 2020).

Have students set some of their own goals in the classroom. Encourage them to set challenging yet realistic goals; caution them against always striving for perfection.

On average, children and adolescents who can effectively control their emotions have more friends, display better social skills, and learn more readily (Aikins & Litwack, 2011; Davis, 2016; Eisenberg et al., 2009; Raver, 2014). In contrast, those who have trouble keeping their feelings in check are more likely to be lonely and depressed; some exhibit behavior problems at school, and others become chronic victims of school bullies (Buckley & Saarni, 2009; Silk et al., 2003).

Self-Instructions Sometimes learners simply need reminders of how to behave in particular situations. Effective learners often use **self-instruction** to guide themselves through complex situations. Many students do not know how to use this strategy, but fortunately we can teach our students to *remind themselves* about appropriate actions. One effective approach involves five steps (Meichenbaum, 1977):

1. *Cognitive modeling:* The teacher models self-instruction by repeating instructions aloud while simultaneously performing the activity.
2. *Overt, external guidance:* The teacher repeats the instructions aloud while the learner performs the activity.
3. *Overt self-guidance:* The learner repeats the instructions aloud while performing the activity.
4. *Faded, overt self-guidance:* The learner whispers the instructions while performing the activity.
5. *Covert self-instruction:* The learner silently thinks about the instructions while performing the activity.

As you can see in these steps, the teacher initially serves as a model both for the behavior and for the self-instructions and then gradually transfers responsibility to the learner. Steps 3 through 5 in the process may remind you of Vygotsky's concepts of *self-talk* and *inner speech* (see Chapter 2).

Teaching self-instructions can be useful in helping students acquire and improve complex athletic skills (Hatzigeorgiadis et al., 2011). It can also be quite effective in working with students who consistently exhibit behavior problems, such as chronic impulsivity or dishonesty (Carter & Doyle, 2006; Meichenbaum, 1985). Furthermore, applications are now available for programming individualized self-instructions into a smartphone or other mobile devices (e.g., search the internet for "self-talk apps") (Smith et al., 2015).

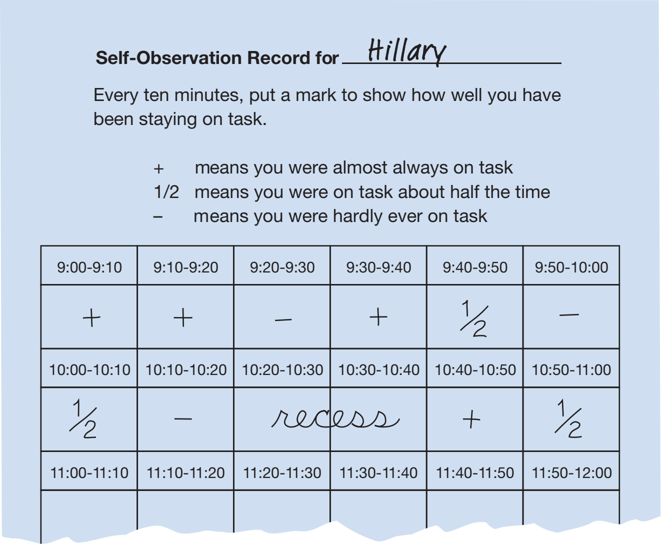
Self-Monitoring Another important aspect of self-regulation while working on a task is to observe oneself in action—a process known as **self-monitoring** (or *self-observation*). To make progress toward important goals, learners must be aware of how well they're currently doing. When they see themselves making progress, they're more likely to continue with their efforts (Schunk & Zimmerman, 1997).

Have students observe and record information about their own behavior.

Learners aren't always astute monitors of their own behavior, however (Karpicke et al., 2009; Winne & Haldwin, 1998). For instance, they may not be aware of how frequently they do something incorrectly or ineffectively, or of how *in*frequently they do something well. Specific, concrete mechanisms can often enhance their self-monitoring. For example, if Carson speaks out of turn too often, we can ask him to make a checkmark on a sheet of paper every time he catches himself talking at inappropriate times. And if Hillary has trouble staying on task during assigned activities, we can ask her to stop and reflect on her behavior every few minutes (perhaps with the aid of an electronic beeper) to determine whether she was staying on task during each interval. Figure 8.10 illustrates the type of form we might give Hillary to record her observations.

Such self-focused observation and recording can bring about noticeable changes—sometimes quite dramatic ones—in learners' behavior. For example, self-monitoring can be used to increase students' participation in class and diligence in completing assignments. It's also effective in reducing aggression and such disruptive behaviors

Figure 8.10 Example of a self-monitoring sheet for staying on task.



Self-Observation Record for Hillary

Every ten minutes, put a mark to show how well you have been staying on task.

+ means you were almost always on task
1/2 means you were on task about half the time
− means you were hardly ever on task

9:00-9:10	9:10-9:20	9:20-9:30	9:30-9:40	9:40-9:50	9:50-10:00
+	+	−	+	½	−
10:00-10:10	10:10-10:20	10:20-10:30	10:30-10:40	10:40-10:50	10:50-11:00
½	−	recess		+	½
11:00-11:10	11:10-11:20	11:20-11:30	11:30-11:40	11:40-11:50	11:50-12:00

as talking out of turn and getting out of one's seat. Nevertheless, self-monitoring requires effort and utilizes working memory—thus we need to support students' use of self-monitoring strategies so that the process of monitoring does not become too burdensome (i.e., burdensome enough to actually impede the student's performance on a task) (Baars et al., 2018; Belfiore & Hornyak, 1998; Plavnick et al., 2010; Prater et al., 2011; Reid et al., 2005; Webber et al., 1993).

Use of technology can further enhance learners' self-monitoring capabilities (Bear et al., 2010; Hitchcock et al., 2003; Prater et al., 2011). Even preschool children can monitor themselves and avoid distractions while using some educational apps developed for iPads and other tablets (Axelsson et al., 2016). Consider, for example, the case of Charles, a highly intelligent fifth grader whose behaviors—aggression, temper tantrums, regular refusals to complete schoolwork—had his parents and teachers totally exasperated. Nothing had worked with Charles—not traditional behaviorist techniques (e.g., systematic praise, time-outs, a token economy), counseling, or paper-and-pencil self-monitoring sheets. But when his special education teacher began making videos of Charles and then showing him his behaviors in math class, he was appalled at what he saw: "Do I really look like that?" "Did I really say that?" "Turn it off!" Charles expressed a strong desire to be "normal," his classroom behaviors became noticeably more compliant and respectful, and he began to appreciate the praise, tokens, and other reinforcers he'd previously shunned (Bear et al., 2010, p. 83).

Ask students to evaluate their own performance.

Self-Regulated Behaviors After Completing a Task

Self-Evaluation To be truly self-regulating, learners must not only monitor but also *judge* their own behavior, as Charles obviously did when he watched the videos. In other words, they must engage in **self-evaluation**. Reasonably accurate self-evaluation depends on having appropriate standards for behavior, of course, and also on having relatively objective techniques for monitoring one's own actions. When learners have such prerequisites, we can use strategies such as the following:

- Have students write daily or weekly journals in which they address the strengths and weaknesses of their performance.
- Arrange small-group peer conferences in which several students discuss their reactions to one another's work.
- Have students assemble portfolios of what they consider their best work, with a self-evaluation of each entry. (Paris & Ayres, 1994; Paris & Paris, 2001)

Chapter 15 offers recommendations for helping students create portfolios.

In addition, we can provide self-assessment instruments that show students what to look for as they evaluate their work, and we can occasionally have them compare their self-assessments with others' independent judgments of their performance (DuPaul & Hoff, 1998; Mitchem & Young, 2001; Reid et al., 2005).

Self-Imposed Contingencies **Self-imposed contingencies** involve giving oneself reinforcement or punishment for one's behavior. For example, how do you feel when you accomplish a difficult task—perhaps earning an A in a challenging course, or making a 3-point shot in a basketball game? And how do you feel when you fail in your endeavors—perhaps getting a D on an exam or hurting a friend's feelings? When you accomplish something you've set out to do, especially if the task is complex and challenging, you probably feel quite proud of yourself and give yourself a mental pat on the back. In contrast, when you fail to accomplish a task, you're probably unhappy with your performance; you may also feel guilty, regretful, or ashamed (Harter, 1999; Krebs, 2008).

As children and adolescents become increasingly self-regulating, they, too, begin to reinforce themselves when they accomplish their goals—perhaps by feeling proud or telling themselves they did a good job. And they may punish themselves when they do something that doesn't meet their own performance standards—perhaps by feeling sorry, guilty, or ashamed. But self-imposed contingencies aren't necessarily confined to emotional reactions. Many self-regulating individuals reinforce themselves in far more concrete ways when they do something well (Bandura, 1977).

Thus, an additional way to help students become more self-regulating is to teach them self-reinforcement. When students begin to reinforce themselves for appropriate responses—perhaps giving themselves some free time, allowing themselves to engage in a favorite activity, or simply praising themselves—their study habits and classroom behavior can improve significantly (Harris, 1986; Hayes et al., 1985; Reid et al., 2005). In one study, students who were performing poorly in arithmetic were taught to give themselves points when they did well on assignments; they could later use the points to "buy" a variety of items and privileges. Within a few weeks, these students were doing as well as their classmates on both in-class assignments and homework (Stevenson & Fantuzzo, 1986).

Teach students to reinforce themselves for productive behavior.

The most diligent workers and highest achievers in the classroom, on the athletic field, and elsewhere are likely to be individuals who can effectively self-regulate their behavior (Duckworth & Seligman, 2005; Trautwein et al., 2006; Zimmerman & Kitsantas, 2005). But we certainly don't have to leave the development of **self-regulated behavior** to chance. As we teach students strategies for taking charge of their own actions, we should keep several points in mind:

- Students must be physically and cognitively capable of achieving the goals they've set.
- Students must be motivated to change their behavior.
- Students' expectations for change must be realistic and practical; dramatic overnight improvements are rare.
- Students must believe that they will be able to make the necessary changes.

Acquiring effective self-regulation skills is often a slow, gradual process, but with reasonable guidance and scaffolding, virtually all students can master them.

Self-Regulated Learning

To be truly self-regulating, learners must direct and monitor their learning as well as their behavior. In particular, **self-regulated learning** includes the following processes, many of which clearly involve metacognition:

- *Goal setting.* Self-regulating learners know what they want to accomplish when they read or study—perhaps to learn specific facts, gain a broad conceptual understanding of a topic, or simply acquire enough knowledge to do well on a test. Typically, they tie their goals for a particular learning activity to longer-term goals and aspirations (Nolen, 1996; Winne & Hadwin, 1998; Wolters, 1998; Zimmerman & Moylan, 2009).
- *Planning.* Self-regulating learners determine ahead of time how best to use the time and resources they have available for learning tasks (Zimmerman & Moylan, 2009).
- *Self-motivation.* Self-regulating learners typically feel confident regarding their ability to accomplish a learning task successfully. They use a variety of strategies to keep themselves on task—perhaps reminding themselves of the importance of doing well or promising themselves a reward when they're finished (Pajares, 2009; Usher, 2009; Wolters, 2003a).
- *Attention control.* Self-regulating learners try to focus their attention on the subject matter at hand and to clear their minds of potentially distracting thoughts and emotions (Harnishfeger, 1995; Kuhl, 1985; Winne, 1995). Multi-tasking (e.g., texting with one's friends while studying for a quiz or doing homework) is almost always going to impede students' efforts to self-regulate (Thompson, 2013).
- *Flexible use of learning strategies.* Self-regulating learners choose different learning strategies depending on the specific goals they hope to accomplish. For example,

how they read a magazine article depends on whether they're reading it for entertainment or studying for an exam (Meltzer et al., 2007; van den Broek et al., 2001; Winne, 1995).

- *Self-monitoring.* Self-regulating learners continually monitor their progress toward their goals for studying—for instance, by frequently checking their understanding of and memory for what they're reading (i.e., monitoring comprehension). In addition, they change their learning strategies or modify their goals as necessary (Butler & Winne, 1995; Carver & Scheier, 1990; Zimmerman & Moylan, 2009).
- *Avoiding procrastination.* Self-regulated learners consider the amount of time that it will take to complete a task. For any given task, if a student is going to engage in appropriate self-regulation before the task begins (i.e., setting goals), while doing the task (i.e., regulating one's emotions and monitoring progress), and after the task has been completed (i.e., evaluating learning and imposing contingencies), the learner must avoid procrastinating. When students procrastinate, they are more likely to rush through their work, and less likely to take the time to use appropriate strategies (Kennedy & Tuckman, 2013; Wolters, 2003b; Wolters et al., 2017).
- *Appropriate help-seeking.* Truly self-regulating learners don't necessarily try to do everything on their own; on the contrary, they recognize when they need other people's help and actively seek it out. They're especially likely to ask for the kinds of help that will enable them to work more independently in the future. Furthermore, when students observe their friends asking for help in constructive ways, they're more likely to use similar help-seeking strategies (Butler, 1998; Lee & Shute, 2010; Newman, 2008; Shin 2018; Zusho & Barnett, 2011).
- *Self-evaluation.* Self-regulating learners determine whether the things they've learned have helped them meet their goals. Ideally, they also use their self-evaluations to adjust their use of various learning strategies on future occasions (Schraw & Moshman, 1995; Winne & Hadwin, 1998; Zimmerman & Moylan, 2009).

As noted in Table 8.3, a few elements of self-regulated learning (e.g., conscious efforts to focus attention and completing short learning tasks independently) emerge in the upper elementary grades, and additional ones (e.g., planning, self-motivation) appear in the middle school and high school years. To some extent, self-regulated learning probably develops from opportunities to engage in age-appropriate independent learning activities and to observe other people modeling effective self-regulation strategies (Paris & Paris, 2001; Zimmerman, 2004). Self-regulated learning is also affected by social contexts. Cultural differences in parenting can affect students' use of self-regulation strategies in some cases. For example, research suggests that the families of many Chinese American adolescents emphasize the importance of effort, respect for teachers, and humility; these culturally informed beliefs may promote adolescents' use of self-regulation strategies that positively affect their achievement (Bempechat & Ronfard, 2018). But if we take Vygotsky's perspective for a moment, we might suspect that self-regulated learning also has roots in socially regulated learning (Stright et al., 2001; Vygotsky, 1934/1986; Zimmerman, 1998). At first, a teacher or parent might help children learn by setting goals for a learning activity, keeping the children's attention focused on the task, suggesting effective strategies, and monitoring learning progress. Then, in **co-regulated learning**, the adult and children share responsibility for directing the various aspects of the learning process (McCaslin & Good, 1996; McCaslin & Hickey, 2001; Zimmerman, 2004). For example, a teacher and students might agree on the specific goals of a learning endeavor, or the teacher might prescribe criteria that students might use to self-evaluate their performance. The teacher might initially provide considerable scaffolding for the students' learning efforts and then gradually remove it as students become more proficient self-regulators. Alternatively, several learners of *equal ability* might collectively regulate a learning task, perhaps in a cooperative group activity (Hickey, 2011; Volet et al., 2009). In such a situation, different learners can take on different responsibilities and monitor one another's progress.

When children and adolescents are self-regulated learners, they set more ambitious academic goals for themselves, learn more effectively, and achieve at higher levels (Butler & Winne, 1995; Corno et al., 2002; Greene & Azevedo, 2009; Mega et al., 2014). Self-regulation becomes increasingly important in adolescence and adulthood, when many learning activities—reading, doing homework, seeking needed resources on the internet, and so on—occur in isolation from other people and thus require considerable self-direction (Trautwein et al., 2006; Winne, 1995; Zimmerman & Kitsantas, 2005). Even at advanced grade levels, however, many students have few self-regulated learning skills, perhaps in part because traditional instructional practices do little to encourage them (Paris & Ayres, 1994; Winters et al., 2008; Zimmerman & Risemberg, 1997).

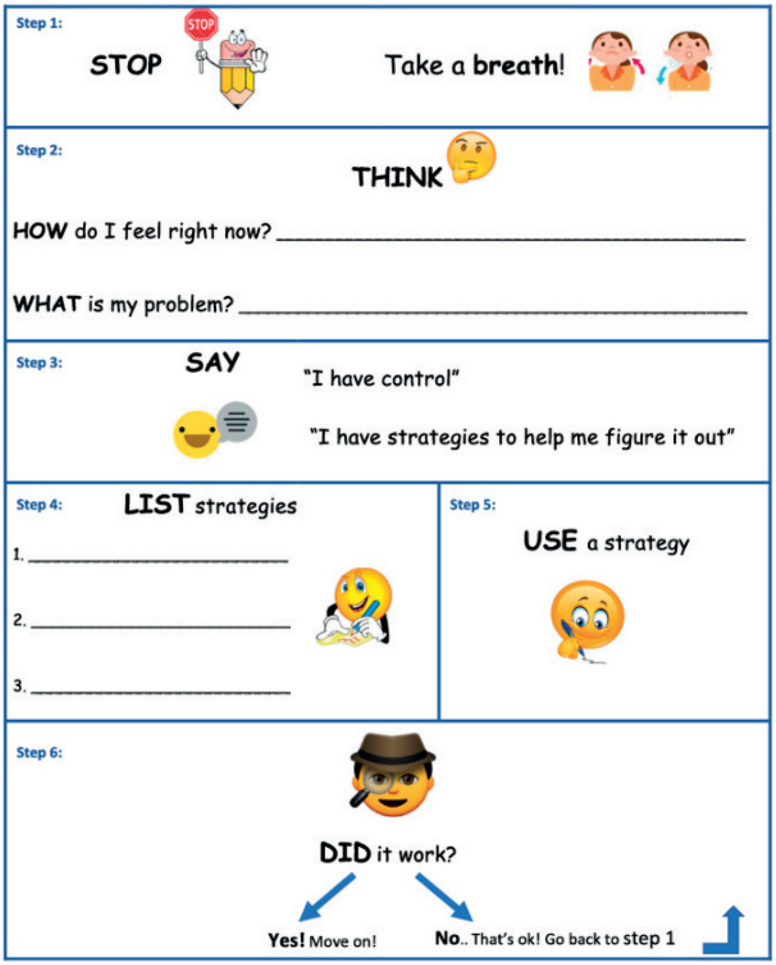
Promoting Self-Regulated Learning To promote self-regulated learning, we must, of course, teach students the kinds of cognitive processes that facilitate learning and memory. In addition, researchers have suggested the following strategies:

- Encourage students to set some of their own goals for learning and then to monitor their progress toward those goals.
- Give students opportunities to work without teacher direction or assistance; include independent activities in which students study by themselves (e.g., seatwork assignments, homework), small-group activities in which students help one another learn (e.g., peer tutoring, cooperative learning), and technology-facilitated lessons that provide scaffolding.
- Occasionally, assign activities in which students have considerable flexibility regarding goals and use of time (e.g., research papers, creative projects).
- Teach time-management strategies (e.g., setting aside specific times to study at home, prioritizing assignments based on difficulty and due dates, avoiding procrastination).
- Provide the scaffolding students need to acquire self-regulation skills (e.g., give them checklists they can use to identify what they need to do each day and to determine when they've completed all assigned work).
- Model self-regulation strategies by thinking aloud while using such processes, and then give students constructive feedback as they engage in similar processes.
  - Encourage students to seek short-term, focused help to overcome temporary difficulties in understanding.
  - Teach students to inhibit behaviors when necessary (e.g., "Simon Says" is a great way to do this, as children have to learn to inhibit their desire to do what Simon says in order to win).
- Demonstrate for students how they can remove distractions from their immediate contexts (e.g., remind them to put their smartphones out of sight).
- Consistently ask students to evaluate their own performance and have them compare their self-assessments to teacher assessments. (Belfiore & Hornyak, 1998; Bronson, 2000; DeMarie, 2017 (Simon Says example); Duckworth et al., 2016; Falco, 2008; Kitsantas et al., 2015; McCaslin & Good, 1996; McMillan, 2010; Meltzer et al., 2007; Muis et al., 2016; Newman, 2008; Paris & Paris, 2001; Perry, 1998; Perry et al., 2002; Schunk & Zimmerman, 1997; Stoeger et al., 2014; Winne & Hadwin, 1998; Wong et al. 2008; Zimmerman & Risemberg, 1997).

Self-Regulated Problem Solving

Effectively directing one's own efforts in tackling complex problems—that is, **self-regulated problem solving**—involves many of the same components as self-regulated learning: goal setting, self-motivation, attention control, self-monitoring, self-evaluation, and so on (Zimmerman & Campillo, 2003). And just as teacher scaffolding facilitates the development of self-regulated learning skills, so, too, does it facilitate the acquisition of self-regulated problem-solving strategies.

Figure 8.11 Example of a strategy that teachers can ask students to use to foster self-regulated learning.



Step 1: STOP Take a breath!

Step 2: THINK

HOW do I feel right now? ____________________

WHAT is my problem? ____________________

Step 3: SAY "I have control"

"I have strategies to help me figure it out"

Step 4: LIST strategies

1. ____________________

2. ____________________

3. ____________________

Step 5: USE a strategy

Step 6: DID it work?

Yes! Move on! No.. That's ok! Go back to step 1

Teach students the mental steps they can follow to solve complex problems more effectively.

We might also provide a general structure for students to follow as they approach complex problems—for example, by encouraging them to ask themselves such questions as, "Why am I using this strategy?" and "Am I sure this answer makes sense?" (Berardi-Coletta et al., 1995; Desoete et al., 2003). Figure 8.11 provides an example of this.

Self-regulated problem solving is important not only for solving academic problems but for solving social problems as well. For instance, to help students deal more effectively with interpersonal conflicts, we might teach them to take these steps:

1. Define the problem.
2. Identify several possible solutions.
3. Predict the likely consequences of each solution.
4. Choose the best solution.
5. Identify the steps required to carry out the solution.
6. Carry out the steps.
7. Evaluate the results. (Elliott & Busse, 1991; Meichenbaum, 1977; Weissberg, 1985; Yell et al., 2001)

Teach students to use appropriate self-regulation strategies while doing online activities.

Following such steps often helps students who have interpersonal problems—for instance, students who are either socially withdrawn or overly aggressive—to develop more effective social skills (Harris, 1982; Meichenbaum, 1977; Yell et al., 2001).

Self-Regulation in Online Learning Environments As a student, you quite likely have been involved in some kind of online learning, particularly since the Covid-19 pandemic. As technology continues to develop and becomes more readily available, various forms of online learning will be used more regularly by students and teachers.

When you think about online learning, what is the first thing that comes to mind? For many of us, we think of "online learning" as a course that is completely delivered and taken online. But in actuality, online learning includes a much broader range of learning experiences.

Experiencing Firsthand

What Is Online Learning?

Have you ever had to do any of the following as part of a course you took either in college or prior to college?

- Participated in an online discussion board or discussion group (e.g., via Zoom)
- Used a simulation activity that is delivered via a computer
- Listened to a lecture online
- Watched a demonstration online
- Completed a project online using shared documents
- Taken a quiz or test directly online
- Completed and submitted a homework assignment online

If you answered "yes" to any of these, then you have participated in online learning. Online learning does not just occur when students take a full course online; online learning often is integrated into our instruction. As a teacher, you might be asked to deliver a small portion of your instruction online, or you might be able to deliver most or all of your instruction online (as many teachers had to do during the pandemic).

Many of our students use technology regularly in many aspects of their lives, and they may feel more efficacious about using the technology than you do as a teacher. Although your students may feel efficacious about using technology, that doesn't mean that they will employ effective self-regulatory strategies to learn successfully from that technology. Online learning requires significant self-regulation on the part of the learner.

Online learning can be either **synchronous** or **asynchronous**. Synchronous online learning occurs when the activities take place at a specifically scheduled time; in contrast, in **asynchronous online learning,** students can complete tasks at their own leisure. The attraction of asynchronous online learning for many students is that they can access the course materials and activities at any time; and while this is a wonderful convenience, it also can be very challenging for students who don't have strong self-regulatory strategies. When students are physically present in your classroom, you can help them to focus and to attend to their work because you are right there with them. But online learning often occurs outside of the teacher's purview—in the library, in the cafeteria, at home, or just about anywhere. Thus, your students must be able to avoid other distractions and focus on the online classwork.

As teachers, we need to be aware of some of the unique features of online learning so that we can help our students to self-regulate when they are working in online settings. Here are some issues and suggestions:

- Online learning environments, by definition, are administered via technology (e.g., on a computer, a tablet, or a smartphone); consequently, there are many distractions that can lure students away from the online learning materials (e.g., texting, email, various social communication applications). We need to remind our students that they will be faced with these distractions, and that to get their online work completed accurately and efficiently, they should temporarily disable some of those distractions.

It is particularly helpful to demonstrate how to avoid such distractions; for example, a teacher can project a portion of an online unit in the classroom, and then demonstrate how to close other windows on the computer that may contain distractions. In fact, students, teachers, and parents can even install programs on laptops, phones, and tablets that can temporarily disable temptations (Duckworth et al., 2016).

- In asynchronous learning environments, students make many of their own decisions—they decide when to use the online materials, in what order, and how much time to spend with the materials. We need to help our students to make appropriate decisions about how to complete their online assignments. We can support our students by helping them to make calendars where they can schedule their online work appropriately so that they can meet approaching deadlines. Many online learning systems allow the instructor to include a calendar or a reminder application that can help students to time their involvement appropriately. You even can structure online learning so that some activities (e.g., watching a video and commenting on it) are only available for a limited amount of time (e.g., for one week) or with some activities needing to be completed before students can move on. This can help your students to manage their time more effectively—if they don't watch the video during the week when it is available, they won't be able to complete that activity.
- Encourage students to keep a record of their progress with online learning. Even though online learning is very convenient and reduces paper, some of our students will benefit from writing down (e.g., in a notebook) how far they have progressed and what they need to do next in the online environment.
- Students can still ask questions during online learning, but we need to make sure that they know how to ask questions. Some online learning environments allow the student to send a message to the teacher; others provide an online forum where students can consult with each other or with the teacher; some even have built in audio- and video-conferencing capabilities, so that students can ask the teacher for help in real time. Nevertheless, much of this will be new to our students, so we have to show them how to use these tools effectively.
- Utilize the technology itself to remind your students to use self-regulatory strategies. Many learning management systems allow teachers to build messages and reminders into online materials. For example, while students are working on an online simulation, prompts can be inserted that remind students to close other open windows (i.e., that might access email or social media).
- There are some general self-regulated learning strategies that work with online learning, but there is variation across subject domains as well. All online learners will benefit from self-regulatory strategies that encourage them to manage their time well or to avoid online distractions, but we need to recognize that there will be some strategies that will be particularly useful in specific subject areas. For example, students who are learning about history online may need to question the authenticity and accuracy of various sources of information about historical events, whereas students studying mathematics online would probably not need to use this strategy. (Greene et al., 2015; Liu & Hmelo-Silver, 2009; Singh, 2004; Wandler & Imbriale, 2017)

Promoting Self-Regulation in Students at Risk

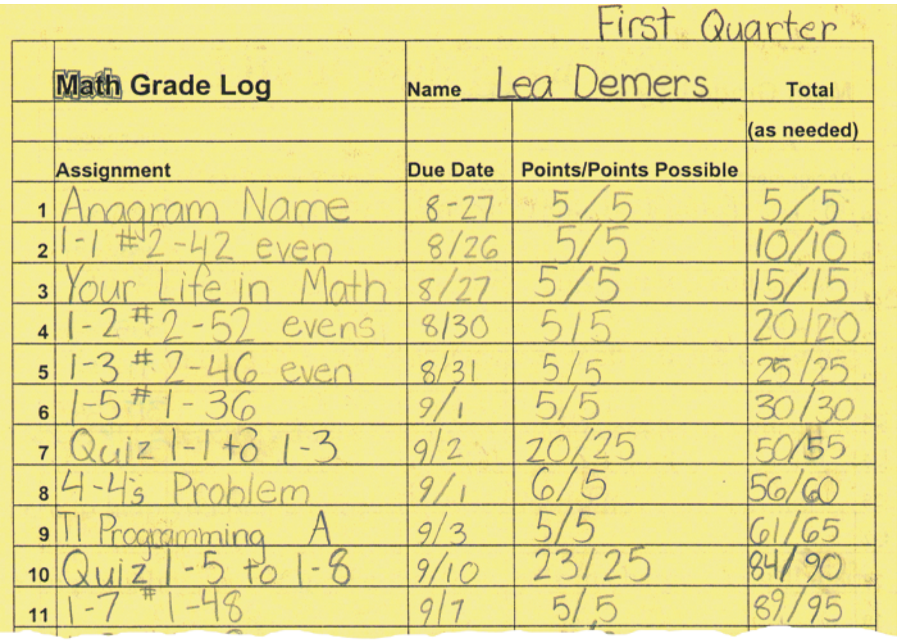
Some students have few outside role models for effective study habits—few people in their out-of-school lives who can model the self-regulated learning strategies they'll need to succeed in high school and postsecondary education (Chen & Morris, 2008). As a result, these students may have little knowledge about how to accomplish goals such as graduating from high school, attending college, and eventually becoming successful in their jobs (Belfiore & Hornyak, 1998; Wilson & Corbett, 2001). For example, in a study with low-income, inner-city middle school students (Wilson & Corbett, 2001), researchers found that many of the students aspired to professional careers (doctor, lawyer, teacher, etc.) yet misbehaved in class, inconsistently completed homework, and often skipped school. They had little idea about what it would take to do well in their studies, as this interview with one of the students reveals:

> ***Adult:*** Are you on track to meet your goals?
>
> ***Student:*** No. I need to study more.
>
> ***Adult:*** How do you know that?
>
> ***Student:*** I just know by some of my grades. [mostly Cs]
>
> ***Adult:*** Why do you think you will be more inclined to do it in high school?
>
> ***Student:*** I don't want to get let back. I want to go to college.
>
> ***Adult:*** What will you need to do to get better grades?
>
> ***Student:*** Just do more and more work. I can rest when the school year is over.[1]

Motivation and effort are important, but so are planning, time management, regular self-monitoring and self-evaluation, and appropriate help-seeking—things about which this student seemed to have little knowledge (Wilson & Corbett, 2001).

Fortunately, explicit instruction in self-regulating strategies can help students at risk begin to acquire more effective study habits (Cosden et al., 2001; Eilam, 2001; Graham & Harris, 1996; Miller et al., 2003). Sometimes instruction can take place in structured after-school homework programs, in which students have considerable scaffolding for such basic skills as keeping track of homework assignments and due dates, developing plans to complete assignments in a timely manner, and locating helpful resources. But we can also provide scaffolding for self-regulated activities during regular school hours—for instance, distributing forms that students can use to keep track of what they've already done and still need to do. A daily log sheet, such as that presented in Figure 8.12, can help middle school students keep track of their math assignments and monitor their performance. The form has its limits, because it provides no place for students to record the types of problems they get wrong, the kinds of errors they make, or any other information that might help them improve. For students with few

Figure 8.12 On this daily log sheet, 13-year-old Lea has kept track of her math assignments, their due dates, and her performance on them.



First Quarter

Math Grade Log **Name** Lea Demers

	Assignment	Due Date	Points/Points Possible	Total (as needed)
1	Anagram Name	8-27	5/5	5/5
2	1-1 #2-42 even	8/26	5/5	10/10
3	Your Life in Math	8/27	5/5	15/15
4	1-2 #2-52 evens	8/30	5/5	20/20
5	1-3 #2-46 even	8/31	5/5	25/25
6	1-5 #1-36	9/1	5/5	30/30
7	Quiz 1-1 to 1-3	9/2	20/25	50/55
8	4-4's Problem	9/1	6/5	56/60
9	TI Programming A	9/3	5/5	61/65
10	Quiz 1-5 to 1-8	9/10	23/25	84/90
11	1-7 #1-48	9/7	5/5	89/95

---

[1] Dialogue from *Listening to Urban Kids: School Reform and the Teachers They Want*, by Bruce L. Wilson and Dick Corbett, p. 23. Copyright © 2001 by the State University of New York Press. State University of New York. Reprinted with permission. All rights reserved.

self-regulation strategies, however, using such a form can start them on the road to effective self-monitoring. In addition, we can provide students with sheets (either on paper or in an online format) that encourage them to engage in self-regulatory behaviors while completing specific academic tasks.

Sometimes we also will need to promote self-regulation in our students to help them achieve longer-term goals. For example, some students may conclude that they can't go to college because of financial constraints or because nobody else in their family has attended college. We can direct these students toward individuals (e.g., school counselors) who can inform them about scholarships and help them to develop short- and long-term plans that include self-regulatory strategies. In addition, there are programs available that can help *parents* develop self-regulatory skills related to planning for the financial aspects of college and help students to prepare for college (a nice example of this can be found at https://iknowican.org/ready-set-college/get-ready//).

Supporting Students with Special Needs Students with disabilities often grow up in tightly controlled and structured environments, and some have brain abnormalities that make self-regulation difficult. Thus, many of these students may especially benefit from explicit instruction in self-regulation strategies and scaffolded opportunities to self-regulate some of their own activities (Coch et al., 2007; Wehmeyer et al., 2007). For instance, we might encourage students with disabilities to set their own goals, especially goals that are concrete, specific, and accomplishable within a short time-period. These students are also well served when we teach them self-monitoring, self-reinforcement, and self-regulated problem-solving skills (Butler & Schnellert, 2015; Cunningham & Cunningham, 2006; Reid et al., 2005; Sullivan & Conoley, 2004).

Chapter 5 identifies specific categories of special needs.

Diversity in Transfer, Problem Solving, Creativity, Critical Thinking, and Self-Regulation

Learning Objective 8.6 Give examples of diversity you might see in transfer, problem solving, creativity, critical thinking and self-regulated learning as a result of students' cultural backgrounds, disabilities, or advanced cognitive development.

We might reasonably speculate that Western schools' focus on meaningful learning and conceptual understanding enhances students' ability to be creative problem solvers (e.g., Schommer-Aikins & Easter, 2008). More significant, however, has been the finding that experiences in *two or more cultures* enhance creative thinking and behaviors. Quite possibly, such a multicultural background exposes learners to a broader range of concepts, ideas, and perspectives from which to draw when trying to think about a topic or problem in nontraditional ways (Leung et al., 2008).

Critical thinking is another complex cognitive process that seems to depend somewhat on students' cultural backgrounds. Some cultures place high value on respecting one's elders or certain religious leaders, and in doing so, they may foster the epistemic belief that "truth" is a cut-and-dried entity that is best gained from authority figures (Chinn & Buckland, 2012; Losh, 2003; Qian & Pan, 2002; Tyler et al., 2008). Furthermore, a cultural emphasis on maintaining group harmony may discourage children from debating differences in perspectives, which critical thinking often entails (Asterhan & Schwarz, 2016; Kağitçibaşi, 2007; Kuhn & Park, 2005).

In some situations, then, we must walk a fine line between teaching students to critically evaluate persuasive arguments and scientific evidence on the one hand, and to show appropriate respect and strive for group harmony in their community and culture on the other. But even given the constraints of certain cultural norms and practices, adults and children alike typically benefit from instruction in critical thinking skills. One potentially effective approach is to suggest that students pose questions in a nonthreatening way, perhaps like this: "What if someone were to criticize your idea by saying _________? How might you respond?"

Some diversity in self-regulation—especially diversity related to **effortful control**—is the result of maturational changes in the brain (see the Applying Brain Research feature, "Understanding and Accommodating Individual Differences in Self-Regulation"). Girls on average tend to be more self-regulating than boys as early as kindergarten, although during adolescence, self-regulation seems to be beneficial for very high-achieving females, but not for very low-achieving females (Kuo et al., 2021; Lenroot et al., 2007; Matthews et al., 2009).

Culture, too, seems to make a difference. Some cultural groups—for instance, many East Asian cultures—place particular importance on emotional restraint and self-discipline. Children growing up in these cultures are apt to be hard workers who can focus their attention and work independently on assigned tasks for long periods (Chen & Wang, 2010; Cole et al., 2006; Lamm et al., 2018; Morelli & Rothbaum, 2007; Trommsdorff, 2009). Other cultures may place greater emphasis on working collaboratively with others. Children growing up in Black or Latino/a/x cultures may have particular strengths in managing multiple tasks and working in small groups (Boykin et al., 2005; Milner, 2011). Moreover, some differences are due to environmental effects. For example, children who grow up in high poverty households sometimes experience delayed development of self-regulation (Roy et al., 2014). And children whose parents are highly controlling may experience decrements in self-regulation during adolescence (Rogers et al., 2019).

Teach students tactful and respectful ways of critiquing other people's arguments and viewpoints.

Accommodating Students with Special Needs

In addition to differences that might be a function of cultural background, researchers have observed differences in complex thinking skills for students with various disabilities and for students who have advanced cognitive abilities. Table 8.4 presents some of the characteristics you're likely to see in students with special educational needs, along with recommendations for working with these students.

Applying Brain Research

Understanding and Accommodating Individual Differences in Self-Regulation

Learners' ability to regulate their behaviors and emotions depends largely on two areas in the front part of the brain—the *prefrontal cortex* and the *anterior cingulate cortex*—that continue to develop over the course of childhood, adolescence, and early adulthood (Kelley et al., 2019; Velanova et al., 2008). In normal brain development, these two areas gradually gain some control over a set of structures in the middle of the brain—including the *amygdala*—that are heavily involved in emotions. To some degree, then, effective self-regulation requires maturational changes that come only slowly with development (Lewis & Stieben, 2004; Rothbart, 2011; Steinberg, 2009; Wisner Fries & Pollak, 2007).

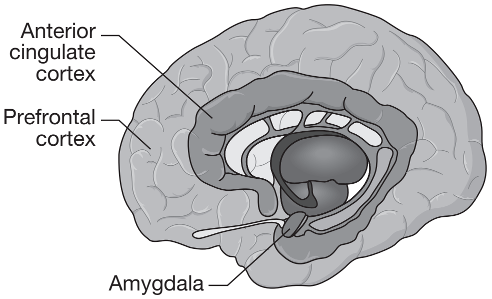
Compounding the problem for adolescents is that the changing hormone levels accompanying puberty can increase their sensitivity and reactions to high-stress situations. For example, the increasing testosterone levels in teenage boys makes some of them especially prone to impulsive aggressive responses (Moore & Rosenthal, 2006; Walker et al., 2010).

Yet in any age group, learners differ in their ability to regulate their behaviors, emotions, and cognitive processes. Some of this variability is the result of differences in effortful control, which appears to have its basis in the brain. In particular, some learners are better able than others to consciously restrain themselves from making impulsive responses when other, less-dominant responses might be more productive (Bates & Pettit, 2007; Rothbart, 2011; Rothbart et al., 2007; Wass, 2021). Students who show high levels of effortful control can better plan ahead, focus their attention, and keep inappropriate emotional reactions in check. Such students also tend to be better behaved in class, to achieve at higher levels than their classmates who have less self-control, and are more likely to attend a four-year college or even graduate school (Blair & Razza, 2007; Liew et al., 2008; Valiente et al., 2008; Véronneau et al., 2014).

As you can see, then, some students may need more guidance and support than others in acquiring self-regulation skills. With this point in mind, we offer two suggestions:

- Individualize the scaffolding students need to regulate their behaviors. Some students are likely to need considerable structure to help them keep unproductive behaviors in check; for example, this will be true for many students who have been identified as having emotional and behavioral disorders. Clear rules for behavior, explicit response–consequence contingencies, and concrete mechanisms for self-monitoring and self-evaluation are often in order. Also useful are simple technological devices—such as small buzzers that a teacher or other adult can remotely activate—that either remind students of things they should be doing or give them feedback that they're doing something well (Cooper et al., 2007).

- Teach strategies for keeping counterproductive emotions in check. Especially when working with students who are prone to emotional volatility, we can provide concrete guidance about how they might control feelings that would lead them to behave in ways they'd later regret. For instance, we might suggest that they count to 10 and take a few deep breaths in order to calm down before responding to a provocation on the playground. And we can help them brainstorm possible "silver linings" in disappointing circumstances (Fletcher & Cassady, 2010; Silk et al., 2003).



STUDENTS IN INCLUSIVE SETTINGS

Table 8.4 Promoting Advanced Thinking Skills in Students with Special Educational Needs

Category	Characteristics You Might Observe	Suggested Strategies
Students with specific cognitive or academic difficulties	• Difficulty in transferring learned information to new situations • Difficulties in problem solving, perhaps because of limited working memory capacity, inability to identify important aspects of a problem, inability to retrieve appropriate problem-solving strategies, or limited metacognitive problem-solving skills • Less self-regulation of learning and behavior	• Encourage and scaffold transfer of school topics. • Model effective problem-solving strategies, and scaffold students' efforts to use them (e.g., point out significant pieces of information in word problems, teach questions that students should ask themselves as they work their way through problems). • Present simple problems at first, then gradually move to more difficult problems as students gain proficiency and self-confidence. • Teach techniques for minimizing the load on working memory during problem solving (e.g., writing parts of a problem on paper, drawing a diagram of the problem, breaking larger tasks down into smaller tasks).
Students with social or behavioral problems	• Deficiencies in social problem-solving skills • Less self-regulation of emotions and behaviors	• Teach strategies for solving social problems (e.g., taking a multistep approach that includes defining the specific problem, identifying possible solutions, and predicting the likely outcomes of each one). • Teach, demonstrate, and practice self-regulation strategies (e.g., self-monitoring, self-regulated problem solving).
Students with general delays in cognitive and social functioning	• Difficulty in transferring information and skills to new situations • Few effective problem-solving strategies • Little, if any, ability to think creatively or critically about classroom topics • Little or no self-regulation of learning and behavior	• Teach new information and skills in the specific contexts and situations in which students should be able to use them. • Present simple problems and guide students through each step needed to solve them. • Promote self-regulation (e.g., by teaching self-monitoring, self-instructions).
Students with physical or sensory challenges	• No consistent deficits in complex cognitive processes; deficits sometimes due to students' limited experiences with tasks that require such processes • Few opportunities to develop self-regulation skills because of health limitations and/or a tightly controlled environment	• Address any deficits in complex processes using strategies you would use with general education students, making appropriate accommodations for physical and sensory limitations. • Teach skills that promote self-sufficiency and independence.
Students with advanced cognitive development	• More frequent transfer of learning to new situations • Greater effectiveness in problem solving, more sophisticated problem-solving strategies, greater flexibility in strategy use, and less susceptibility to mental sets • Interest in addressing general problems of society • Divergent thinking (e.g., asking unusual questions, giving novel responses) • Greater facility with critical thinking • More effective self-regulated learning	• Place greater emphasis on complex processes (e.g., transfer, problem solving) within the curriculum. • Teach advanced thinking skills within the context of specific topics rather than in isolation from academic content. • Accept and encourage divergent thinking, including unanticipated yet appropriate responses. • Encourage critical analysis of ideas, opinions, and evidence.

SOURCES: Beirne-Smith et al., 2006; Brownell et al., 1993; B. Clark, 1997; DuPaul & Eckert, 1994; Ellis & Friend, 1991; Goldstein & Rider, 2006; Heward, 2009; Kercood et al., 2012; Maker, 1993; Mastropieri & Scruggs, 2007; Mendaglio, 2010; Mercer & Pullen, 2005; Piirto, 1999; Stanley, 1980; Torrance, 1989; Turnbull et al., 2016.

Chapter 8 What Have You Learned?

If we focus activities on learning isolated facts and if we also use assessment techniques that emphasize knowledge of those facts, students will naturally begin to believe that school learning is a process of absorbing information in a rote fashion and regurgitating it later on. But if we instead focus class time and activities on *doing things with* information—for instance, applying, analyzing, and critically evaluating it—then students should acquire the cognitive processes and skills that will serve them well in the world beyond the classroom. With these points in mind, let's return to the learning outcomes presented at the beginning of the chapter.

8.1 **Explain how people's metacognitive knowledge and skills influence their learning and academic achievement; also explain how you can promote metacognitive development in your own students.** *Metacognition* includes both the beliefs students have about their own cognitive processes and their attempts to strategically control those processes to maximize learning and memory. Some effective learning strategies, such as taking notes and writing summaries, are overt ones easily seen in students' behaviors. Others, such as identifying important ideas and self-monitoring comprehension, are covert ones that take place mostly or entirely inside students' heads. Students' use or nonuse of effective strategies depends, in part, on the particular learning task at hand and also, in part, on (a) students' ability to reflect on the effectiveness of previous strategies, (b) their beliefs about the nature of knowledge and learning (i.e., their *epistemic beliefs*), and (c) their ultimate goals for learning and classroom performance. As teachers, we should promote students' metacognitive development while we teach them academic content—for example, by providing guidance and scaffolding in note taking, elaborative processing, and summarizing, and by having students use new strategies in small-group activities. Students are especially likely to need our guidance and scaffolding when they engage in learning activities that require considerable decision making, such as activities involving hypermedia in instructional software or on the internet.

8.2 **Describe various forms that transfer might take, the conditions in which transfer is most likely to occur, and apply research findings about transfer to your classroom practices.** Transfer occurs when something learned in one situation either helps or hinders learning or performance in another situation; these two phenomena are known as *positive transfer* and *negative transfer*, respectively. Some instances of transfer involve applying specific facts to a similar situation; for example, a student might apply her knowledge of French vocabulary words in a Spanish class. Other instances involve general transfer of knowledge, skills, or attitudes to a very different situation; for example, a student might apply study strategies learned in a history class to a science class and, after gaining self-confidence in one class, might bring that self-confidence to other classes as well. Students are more likely to transfer what they learn when they engage in meaningful learning (rather than rote learning), when they see the relevance of classroom material to diverse disciplines and real-world situations (rather than thinking of it as context-bound), and when they have many opportunities to use the material in new ways.

8.3 **Describe several general factors that influence problem-solving and creativity; also describe teaching strategies that can encourage students to think productively and creatively as they tackle new tasks and problems.** Problem solving involves using what one knows to address a previously unanswered question or troubling situation. Creativity involves new and original behavior that yields a product appropriate for, and in some way valued in, one's culture. Although problem solving and creativity differ somewhat in the extent to which they entail convergent versus divergent thinking, many complex tasks call for *both* problem-solving skills and creative thinking. Schools have traditionally focused attention on well-defined problems, yet the outside world presents many ill-defined tasks and problems that students must also learn how to tackle. To be successful and creative problem solvers, students must (a) compensate for the limits of working memory (e.g., by learning basic facts to automaticity); (b) encode problems in ways that lead them in potentially useful directions in long-term memory; (c) master both step-by-step procedures for particular situations (algorithms) and more general problem-solving strategies (heuristics); and (d) consciously self-direct and self-monitor the overall problem-solving process. As teachers, we can help students become more effective problem solvers in a number of ways—for example, by scaffolding their attempts to solve new and complex problems (perhaps in technology-based simulations), mixing up the kinds of problems we ask them to solve in any single lesson or unit, and asking them to explain what they're doing as they work through a problem. Meanwhile, we can foster more creative thinking when we focus students' attention on internal rather than external rewards, ask thought-provoking questions, teach metacognitive strategies essential for creative thinking, encourage risk taking, and provide the time and resources that creativity requires.

8.4 **Identify several different forms that critical thinking might take, and explain how you can help students critically evaluate what they see, hear, and read both inside and outside the classroom.** Critical thinking involves evaluating the accuracy, credibility, and worth of information and lines of reasoning. It can take a variety of forms depending on the situation, and it requires not only (a) a number of cognitive skills (e.g., probabilistic reasoning, scientific reasoning, and argument analysis) but also (b) a general disposition to approach new ideas in a thoughtful, evaluative manner, and (c) a belief that humankind doesn't have all the answers regarding many important topics. As teachers, we should encourage and model a certain amount of intellectual skepticism, give students many opportunities to engage in critical analysis of controversial topics, and ask questions that encourage students to carefully scrutinize and evaluate the ideas they encounter in written documents, classroom discussions, and websites.

8.5 **Identify important components of self-regulated behavior and self-regulated learning, and apply your knowledge of self-regulation to help diverse learners effectively control their behavior, master academic subject matter, and address interpersonal problems.** As children grow older, most of them become increasingly self-regulating. For example, they begin to set standards and goals for themselves, try to keep counterproductive emotions in check, and monitor and evaluate their own behaviors. With development, too, many children gradually acquire strategies for regulating their learning efforts. For example, they conscientiously plan how they might best use their time and resources, motivate themselves to stay on task as they work, apply and evaluate various study strategies, and seek help when they need it. They can be equally self-regulating in addressing interpersonal problems, identifying various possible solutions, and evaluating the end result of whatever solution they choose. As teachers, we can foster the development of self-regulation skills in many ways—for instance, by asking students to set some of their own goals, providing explicit criteria with which they can evaluate their performance, and giving them age-appropriate independence in various situations and tasks. However, we must keep in mind that students in any single age group vary considerably in their ability to control their behaviors and emotions, in part as a result of differences in brain maturation and temperament. Furthermore, some students may have had few outside role models for effective study habits. Some of our students, then, may need considerable guidance and support in their development of self-regulation skills.

8.6 **Give examples of diversity you might see in transfer, problem solving, creativity, critical thinking, and self-regulated learning as a result of students' cultural backgrounds, disabilities, or advanced cognitive development.** Students exhibit considerable diversity in the extent and nature of their complex cognitive thinking processes. For example, students who have had meaningful experiences in two or more distinct cultures are apt to show greater creativity in their thoughts and behaviors. However, students from some cultural backgrounds may be unaccustomed to thinking in divergent, creative ways about complex problems. Students from other backgrounds may have been discouraged from critically evaluating what their elders tell them. Many students with special educational needs may have difficulty transferring what they've learned to new situations and problems; thus, they may need considerable scaffolding in their efforts to effectively apply new knowledge and skills. In contrast, students who show advanced cognitive development tend to be metacognitively sophisticated learners, and they may be quite adept at solving problems and thinking critically and creatively without much teacher assistance.

Practice for Your Licensure Exam

Interview with Charlie

Seventeen-year-old Charlie has been earning As in his high school classes; now, at the end of his eleventh-grade year, he has a 4.0 grade point average. He has particular interests in science and technology; in fact, in addition to challenging coursework at school, Charlie has taken several computer courses at a local community college. His mother says, "He invests a lot of time in projects (writing papers, reports, etc.), but doesn't crack open a book to read or study often."

One afternoon Charlie has the following discussion with an adult:

Adult: Why do you think your grades have been so good?

Charlie: I do the homework, and I do well on the tests. I don't really study—I just make sure to focus on the homework and make sure it makes sense to me.... What I do depends on the circumstances. For math and chemistry, just doing homework and going over it with friends during lunch or something helps. That's about all I do for studying.

Adult: What do you mean, "make sure it makes sense"?

Charlie: If I look at the problem and I know the process of how to do it, like in math and chemistry.

Adult: Let's say that a teacher assigns a textbook chapter for you to read sometime in the next three days. What things would you do—in your head, that is—when you read the chapter?

Charlie: Depends on the book and the class. Probably just skim it. Is the teacher just telling us to read it, or are there questions with it? I think about those things. We have a textbook in my computer programming class. I go through the chapter, look at examples and the [computer] code. I don't look at the other stuff.

Adult: I haven't heard you talk about trying to memorize anything.

Charlie: We do have to memorize. If I write it down once—a formula or something—and can use it in a few problems, I get it.

Adult: Do you ever use flashcards?

Charlie: Flashcards wouldn't work for what I do.

Adult: How do you know when you've really learned something—I mean, *really* learned it—and will remember it for a long time?

Charlie: When I do a couple of problems and they don't seem as hard... when I can get the right answer every time.

Adult: Your teachers probably expect you to do a lot of things outside of class, right? How do you make sure you get them all done?

Charlie: Making lists is really helpful, of everything that's due.

Adult: So what do you do with the lists?

Charlie: I either do things as soon as possible or else procrastinate, do it the night before. Sometimes I have a free block at the end of the day to do it. Or I go home and do my chemistry right away. Or I might wait until the last minute. It depends on whether I'm hanging out with friends.

1. **Multiple-choice question:**

   Charlie says, "I don't really study—I just make sure to focus on the homework and make sure it makes sense to me." Which one of the following terms most accurately describes the nature of this statement?

   a. Algorithm
   b. Metacognition
   c. Critical thinking
   d. Divergent thinking

2. **Multiple-choice question:**

   Which one of the following statements is the best example of *comprehension monitoring?*

   a. "Depends on the book and the class. Probably just skim it."
   b. "I go through the chapter, look at examples and the [computer] code. I don't look at the other stuff."
   c. "When I do a couple of problems and they don't seem as hard... when I can get the right answer every time."
   d. "I either do things as soon as possible or else procrastinate, do it the night before. Sometimes I have a free block at the end of the day to do it."

3. **Constructed-response question:**

   Would you characterize Charlie's learning strategies as involving *rote learning* or *meaningful learning?* Use excerpts from the interview to support your answer.

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 9

Learning and Cognition in Context

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Learning Objectives

- **9.1** Describe five basic assumptions underlying contextual theories of learning and apply these assumptions to classroom practice.
- **9.2** Contrast the benefits of expert–novice interactions with the benefits of peer interactions; explain how you might enhance students' learning through both kinds of interactions.
- **9.3** Explain how learners' cultural backgrounds can influence their interpretations of new information and experiences; also explain how novice learners can effectively participate in one or more communities of practice.
- **9.4** Describe key elements of society that impact learning and explain how authentic activities can enhance learners' performance in their out-of-school lives.
- **9.5** Describe the unique roles that digital technologies and the internet can play in classroom instruction.

CASE STUDY

The Costs and Benefits of Immigration

The students in Mr. Ritchey's ninth-grade class are learning about immigration. Mr. Ritchey spends a few days every year talking about the period during the 1970s when the Khmer Rouge took over the government of Cambodia. He focuses in particular on the many Cambodians who immigrated to the United States to escape the violence in their country. The students first watch a video about the experiences of a family who had to give up everything in Cambodia and move to the United States. The video describes the difficulties that the family experienced both before and after their journey. The students then read a short story called *The Journey* (Sanna, 2016), which describes the difficult journey of a mother and her two young children, who spend many days and nights traveling to reach the border in their attempt to leave Cambodia.

After the students learn about Cambodia, Mr. Ritchey spends some time identifying similarities and differences between the experiences of the Cambodians in the 1970s and those of people who have fled Ukraine after the Russian invasion in 2022. He also spends a lot of time during this unit discussing the supporting services that are needed by immigrants when they arrive in a different country and try to establish new lives there. He talks about the financial costs to the governments of the countries to which people immigrate. He also talks about the many social services that immigrants often need (e.g., help in finding homes, getting jobs, establishing residency, etc.) after arriving in a new country. On the last day of the unit, Mr. Ritchey divides his students into several small groups, and asks them to discuss the following question: "Should a country allocate some of its limited resources to support newly arrived immigrants from war-torn countries, even if there are people in the country that will not receive services to meet their own needs, in order to help the immigrants?"

In one of the small groups, a student named Jordan expresses the opinion that governments need to attend to the needs of their own citizens before meeting the needs of immigrants:

> *"If immigrants are coming to the United States, but we have people in our country who are homeless and who need to get their meals from food pantries, then the government should be helping our own citizens out and making sure their needs are met before helping people who come from other countries, even if they're trying to get out of a really bad situation."*

David, another student in that group, expresses a different opinion, stating that governments do have a responsibility to help anyone in a desperate situation:

> *"Well, we certainly should be helping people in our country who need assistance, but if there are people in other countries who are facing war and might be killed, then we can't turn those people away. We have to find a way to help them out if they want to come here, even if it means that all of us have to sacrifice something."*

- Why might the two boys have come to these different conclusions? What principles of learning and cognition might you draw on to help you make sense of their diverging perspectives?

As we discussed in Chapter 7, human learning typically involves *meaningful learning*—connecting new information and experiences to existing knowledge and beliefs about the world. Often, in fact, people engage in *elaboration*, embellishing on and sometimes distorting new input so that it is a good fit with their current understandings. To the extent that different people retrieve different knowledge and beliefs in any given situation, they're likely to interpret that situation in very different ways. For example, Jordan's answer to Mr. Ritchey's question might reflect the fact that he lives in a neighborhood where many people whom he has known have had to move out of their homes because they could no longer afford to pay their rents or mortgages. David, who has not encountered many people who have experienced financial hardship, isn't able to draw on such personal experiences.

It is probably becoming obvious to you that Jordan's and David's answers to Mr. Ritchey's question were affected by the context in which each student has grown up. Learning always takes place within particular *contexts*—for instance, within a particular classroom environment, social group, culture, and society. The focus of this chapter is on the roles that these various contexts play in student learning.

Basic Assumptions of Contextual Theories

Learning Objective 9.1 Describe five basic assumptions underlying contextual theories of learning and apply these assumptions to classroom practice.

The cognitive theories of learning that we have examined so far tell us a great deal about how our students learn and develop. But in recent decades, psychologists have become increasingly aware that people's learning and development are inextricably dependent on and bound to various physical, social, and cultural contexts. **Contextual theories** of learning vary considerably with regard to the particular contexts they emphasize. Even so, they tend to share most or all of the following assumptions.

- *The brain functions in close collaboration with—rather than in isolation from—the rest of the body.* Obviously, the brain can't function without the health of the rest of the body, and it gets new information from the sensory organs. But in addition, thinking and learning are often intimately intertwined with a learner's physical actions and reactions. For example, when we're pondering complex situations—perhaps math problems or perhaps the shapes and locations of various objects in space—gesturing with our hands or arms can sometimes help us think and talk about the situations more effectively (Goldin-Meadow & Beilock, 2010; Kirk & Lewis, 2017; Segal et al., 2014).
- *Acquired knowledge and skills are often tied to specific physical, social, or cultural activities and environments.* People don't always use what they've learned in situations where it might be relevant—a phenomenon known as situated learning or situated cognition. In some cases, people associate new information and skills only with particular kinds of tasks or problems; for example, they might be accustomed to using their knowledge of algebra in a math class but be unlikely to transfer it to relevant real-world activities such as choosing a sensible mortgage plan. In other cases, people may simply find it *easier* to use newly learned ideas or skills in certain contexts because these contexts provide physical, social, or cultural support for applying the new knowledge—as you'll see in the discussions of the next two assumptions.
- *Learners often think and perform more effectively when they can offload some of the cognitive burden onto something or someone else.* As you should recall from information processing theory, active cognitive processing takes place in working memory, which—*by itself*—can handle only a small amount of information at any one time. For complex tasks, then, it's helpful to shift some of the cognitive load elsewhere—an idea that's sometimes referred to as **distributed cognition** or **distributed intelligence** (e.g., Pea, 1993; Salomon, 1993; Smith & Conrey, 2009). One way to "distribute" the cognitive load is to use physical objects—for instance, by writing parts of a problem on paper or using a calculator to carry out multistep computations. A second way is to organize and interpret the many parts of a situation using concepts, principles, strategies, and other cognitive tools that one's cultural group has developed to address common problems. For example, we might use a *calendar* to keep track of upcoming appointments, or we might draw a *line graph* to see if a particular region's average annual rainfall has substantially increased or decreased over the past few decades.

  Still a third way to distribute the cognitive load is to share it with others. When learners spread a challenging task or problem across many minds, they can draw on multiple ideas. For example, a group of people might brainstorm possible solutions to a local, national, or international problem. Furthermore, in virtually any social group, different people gain expertise in different topics—some become medical doctors, others become engineers, and so on—thereby distributing the group's collective knowledge base.

Here we are revisiting concepts discussed in previous chapters, including *working memory* and *cognitive load* (Chapter 7), *distributed intelligence* (Chapter 5), and *cognitive tools* (Chapter 2).

- *Learners sometimes learn more effectively when they collaborate with others to co-construct meaning.* We've just mentioned how learners can reduce their own cognitive burden, in part, by sharing a task or problem with others. An additional advantage of collaboration is that, as a group, learners can often make better sense of a situation than they might on their own. For example, think about times when you've worked cooperatively with classmates to make sense of confusing academic material. Perhaps by sharing various possible interpretations, your study group jointly constructed a better understanding of the material than any one of you could have constructed on your own. Unlike individually constructed knowledge, which might differ considerably from one individual to another, socially constructed knowledge is shared by two or more people simultaneously. A perspective known as **social constructivism** focuses on such collective efforts to impose meaning on the world.

  Joint meaning-making doesn't necessarily have to occur in a single learning session, however. In some cases, it proceeds gradually over several days or weeks—or even over the course of many decades or centuries. For example, such academic disciplines as mathematics, science, history, economics, and psychology have evolved as the result of long-term collaborations among many individuals. Through these disciplines, people have developed concepts (e.g., *pi* [π], *molecule, historical significance*) and principles (e.g., *Pythagorean theorem, supply–and–demand*, the *limited capacity of working memory*) to simplify, organize, and explain certain aspects of the world or its inhabitants. Literature, music, and the fine arts help us impose meaning on the world as well—for instance, by trying to convey the thoughts and feelings that characterize human experience. Here we see one critical role that *culture* plays in knowledge construction: To the extent that different groups of people use different concepts and principles to explain their physical experiences and to the extent that they have unique bodies of literature, music, and art to capture their psychological experiences, they'll inevitably see the world in diverse ways.
- *With the help and guidance of more knowledgeable individuals, learners benefit from the accumulated wisdom of their cultural group.* Groups of individuals who share a common culture learn from each other. This learning occurs through people's daily interactions, but the learning also accumulates over time, as the members of various cultural groups continuously co-construct their interpretations of events. Over time, the members of a cultural group become increasingly effective and efficient in tackling challenging tasks and problems. As the group gains new members—often through the arrival of new generations—it maintains its effectiveness and efficiency by indoctrinating the novices into its typical ways of interpreting and responding to various situations. Contextual perspectives that emphasize the role of society and culture in promoting learning and development (including Vygotsky's early theory of cognitive development) are collectively known as **sociocultural theories**.

  In virtually any culture, adults and other more experienced individuals continually help children make sense of and respond to new situations in ways the culture deems to be appropriate and productive. In other words, adults *mediate* new situations for children. Over time, children gradually *internalize* adults' ways of interpreting and addressing day-to-day events until they themselves become the experts who guide future generations (e.g., Williams et al., 2020).

Chapter 2 describes Lev Vygotsky's early sociocultural theory, including the process of internalization.

A sociocultural perspective can help us understand Jordan's and David's differing interpretations of the immigration issue in the opening case study. Although both boys grew up in the United States—and, in fact, in the same part of the country—their parents and schools had probably passed along somewhat different ways of looking at immigration and its role in human society. Table 9.1 summarizes the five assumptions, along with some of their implications for instruction.

PRINCIPLES/ASSUMPTIONS

Table 9.1 Basic Assumptions of Contextual Theories and Their Educational Implications

Assumption	Educational Implication	Example
Brain–body interdependence	Encourage students to use their bodies to help them think about and remember what they are learning.	As students try to understand the difference between folded and fault-block mountains, suggest that they use their hands to simulate what the earth's shifting tectonic plates do to create these different types of mountains.
Situated nature of learning and cognition	Have students apply new knowledge and skills to real-world, authentic tasks.	Ask students to design and conduct experiments in which they apply scientific procedures (e.g., separation and control of variables) to questions relevant to their personal lives; provide sufficient scaffolding to enable them to do so in scientifically defensible ways.
Distributed nature of learning and cognition	Teach students how to use various physical and cognitive tools (e.g., technology, algebraic procedures) to help them more effectively gain knowledge and solve new problems. Also, teach them skills that enable them to collaborate with others and draw on the wisdom of experts.	Teach students how to use a search engine such as Google to find information. Teach them how to distinguish between websites that present valid, well-documented information and websites that present erroneous "facts" or highly biased opinions.
Collaborative co-construction of meaning	Convene small groups in which students discuss complex issues with no obvious right and wrong answers.	Assign students to four-member groups that discuss the pros and cons of increasing taxes in their community.
Guidance from more advanced individuals	Teach new concepts and principles that can help students make better sense of complex and potentially puzzling situations.	Use principles of chemistry to explain why water expands when it freezes—a phenomenon that has implications for food storage, road and bridge construction, and the well-being of plants and animals.

Keep in mind that different contexts regularly interact and influence one another. Furthermore, all of them *change over time*—for instance, access to helpful resources and social collaborators changes, and new, ever-more-advanced technological innovations continue to emerge with each passing year.

Our focus in the rest of the chapter will be on two aspects of the larger social context—more specifically, on how thinking and learning are influenced by learners' immediate social environments and broader culture and society, as well as by the many tools and knowledge bases that culture and society have created to enhance human performance. As you may realize, our discussion of these layers has been heavily influenced by the various layered systems that Urie Bronfenbrenner has described in his bioecological systems theory.

As we look at diverse environmental influences on what learners know and think, we must not throw our knowledge of learners' internal cognitive processes out the window. Instead, we must continually remember that contextual factors work *in conjunction with* learners' internal cognitive processes—for instance, processes related to long-term memory storage and retrieval, metacognition, self-regulation, and problem solving (e.g., Greeno, 2015; Kirsh, 2009).

You can also find a discussion of Bronfenbrenner's bioecological systems theory in Chapter 2.

Social Interactions as Contexts

Learning Objective 9.2 **Contrast the benefits of expert–novice interactions with the benefits of peer interactions; explain how you might enhance students' learning through both kinds of interactions.**

Although all of us learn new things on our own, most human learning is, in one way or another, a very social enterprise, involving interaction with more advanced individuals, with equal-ability peers, or both.

Interactions with More Advanced Individuals

Young learners are most likely to construct a productive understanding of the world when older children and adults share with them the many concepts, principles, theories, and other cognitive tools that society has developed to explain the physical and psychological aspects of human experience (Driver, 1995; Sweller et al., 2007; Vygotsky, 1934/1986). For example, children can learn a great deal about various biological species and fragile ecosystems—and are likely to acquire positive attitudes toward science—when firsthand observations in class or on field trips are accompanied by scientific explanations of the phenomena at hand (e.g., Patrick et al., 2009; Zaragoza & Fraser, 2008). Any explanation that helps learners relate what they're observing to particular concepts, principles, or theories is a **mediated learning experience**.

Teach concepts, principles, and theories that help students impose productive meanings on their observations and experiences.

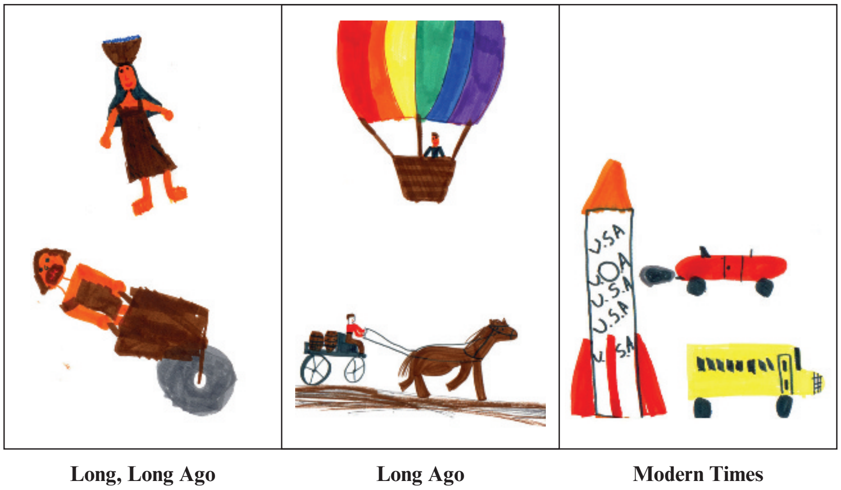
Adults and other more advanced individuals help young learners in another important way as well. More advanced individuals introduce new cognitive and metacognitive strategies and guide learners in how to use these strategies. For instance, in the elementary grades, a teacher and students might co-construct a timeline that organizes information about different modes of transportation over the course of human history (Brophy et al., 2009). Figure 9.1 is an example of such a co-constructed timeline. In the secondary grades, a teacher and students might collaboratively create two-dimensional charts to help them compare and contrast what they're learning about the topography, climate, and economic resources of various countries or geographic regions. Through joint discussions and use of strategies—typically with considerable adult guidance and scaffolding at first—learners gradually internalize the strategies and can begin using them independently (Collins, 2006; Dennen & Burner, 2008; Rogoff, 1990).

Interactions with Peers

As we saw in Chapter 2 in the discussion of Vygotsky's theory, learning and development often are facilitated by interactions that our students have with other individuals. In particular, Vygotsky emphasized how children's thinking develops as they interact with adults and more experienced or knowledgeable peers. Vygotsky's perspective extends to learning in the classroom—learners benefit when, in an effort to make sense of new information and experiences, they share their ideas and perspectives with their peers:

- They must clarify and organize their thoughts well enough to explain and justify them to others.
- They tend to elaborate on what they've learned—for example, by drawing inferences, generating hypotheses, and formulating questions to be answered.

Figure 9.1 In this co-constructed timeline, a teacher provided the general framework, and two students created drawings depicting modes of transportation during different periods in human history.



Wilson, Sara

Regularly engage students in small-group or whole-class discussions that encourage them to exchange views and build on one another's ideas.

- They are exposed to the views of others, who may have more accurate understandings or different—and yet equally valid—perspectives.
- They may discover flaws and inconsistencies in their own thinking.
- They can model effective ways of thinking about and studying for one another.
- With the support of their peers, they can gain practice in more sophisticated learning strategies and reasoning skills, which they can eventually begin to use on their own.
- They can also gain practice in the argumentation skills that experts in various disciplines use to advance the frontiers of knowledge—for instance, presenting evidence in support of conclusions and examining the strengths and weaknesses of various explanations. Moreover, learning seems to be particularly enhanced when students are asked to come to a consensus on an issue that they are discussing.
- They may acquire more advanced *epistemic beliefs*—more sophisticated views of the nature of knowledge and learning. For example, they may begin to realize that genuine understanding involves acquiring an integrated set of ideas about a topic and that such knowledge is likely to evolve gradually over time. (Andriessen, 2006; Bendixen & Rule, 2004; Chinn, 2006; Hatano & Inagaki, 2003; Jadallah et al., 2011; Johnson & Johnson, 2009b; Kuhn, 2015; Kuhn & Crowell, 2011; Murphy et al., 2011; Nussbaum, 2008; Reznitskaya & Gregory, 2013; Schwarz et al., 2000; Sinatra & Pintrich, 2003; Slavin, 2011; Smith, 2007; Tenenbaum et al., 2020; Wentzel & Watkins, 2011)

Chapter 8 describes epistemic beliefs in greater depth.

Peer-group discussions about academic content have social and motivational benefits as well as cognitive ones. Discussing a topic with classmates can help students acquire more effective interpersonal skills (Certo, 2011; Li et al., 2007). It can also have an energizing effect on students and instill a genuine desire to understand a topic better (Hacker & Bol, 2004; Murphy & Mason, 2006). Controversial topics can be especially motivating for them, as long as they can effectively resolve their differences without alienating one another (Chinn, 2006). Clearly, then, students have a great deal to gain from regularly conversing with one another about classroom subject matter.

Creating a Community of Learners

With the benefits of student dialogue in mind and with the goal of promoting social co-construction of meaning, some educators have suggested that we create **communities of learners**, classes in which teachers and students collaborate to construct a body of knowledge about a topic and help one another learn about it. A class that operates as a community of learners is likely to have certain characteristics:

- All students are active participants in classroom activities.
- The primary goal is to acquire a body of knowledge on a specific topic, with students contributing to and building on one another's efforts.
- Students draw on many resources—books, magazines, the internet, and one another—in their efforts to learn about the topic.
- Discussion and collaboration among two or more students occur regularly and play key roles in learning.
- Diversity in students' interests and rates of progress is expected and respected.
- Students and teacher coordinate their efforts in helping one another learn; no one has exclusive responsibility for teaching others.
- Everyone is a potential resource for others; different individuals are likely to serve as resources on different occasions, depending on the topics and tasks at hand. In some cases, students "major" in a particular topic and become local experts on it. Occasionally, people outside the classroom share their expertise as well.
- The teacher provides some guidance and direction for classroom activities, but students may also contribute guidance and direction.

- Mechanisms are in place through which students can share what they've learned with others.
- Constructive questioning and critiquing of one another's work is commonplace.
- The process of learning is emphasized as much as—and sometimes more than—the finished product. (Bielaczyc & Collins, 2006; Brown & Campione, 1994; Campione et al., 1995; Collins, 2006; Engle, 2006; Rogoff et al., 1996; Scardamalia & Bereiter, 2006; Wells, 2011)

Create a community atmosphere in which peer collaboration and mutual support are integral parts of classroom learning and achievement.

When a teacher works toward creating a community of learners in the classroom, the overarching principle is that both the students and the teacher are committed to advancing the collective knowledge, skills, and understanding of all members of the classroom. Essentially, the class engages in **knowledge building**—authentically advancing the group's knowledge about a topic, much as adult researchers do in their efforts to advance the world's knowledge in various academic and professional disciplines. In the process, students create not only tangible products but also *conceptual artifacts*—theories, diagrams, plans, problem-solving strategies, and other cognitive tools they can use, evaluate, and possibly modify over time (Bielaczyc & Collins, 2006; Chen & Hong, 2016; Scardamalia & Bereiter, 2006; Wells, 2011).

In one example of how a community of learners can be structured (Brown & Campione, 1994), students are divided into small groups to study different subtopics falling under a general theme; for instance, subtopics for the theme *changing populations* might be *extinct, endangered, artificial, assisted*, and *urbanized*. Each group conducts research and prepares teaching materials related to its subtopic. The class then reassembles into new groups that include at least one representative from each of the previous groups. Within these new groups, the students teach one another what they've learned. Such an approach, in which different students master different topics and then share their knowledge with classmates, is sometimes called the **jigsaw technique**.

Another approach is to use a computer network to support a community of learners (Bereiter & Scardamalia, 2006; Larrain et al., 2021; Stahl et al., 2006; Zhang et al., 2009). In an electronic environment, students can create a variety of documents—perhaps brief notes, lengthier reports, diagrams, or short stories—and post their work as online files that their classmates can read, react to, and possibly modify or build on. Students might also interact in an ongoing computer-based chatroom or discussion board in which they present questions or issues to which their classmates respond. For example, students might jointly wrestle with the puzzling fact that heat melts some solids but burns others, or they might critique various theories about how humans first migrated to and then spread throughout North and South America (e.g., Hewitt et al., 1995; Hewitt & Scardamalia, 1998).

Working in communities of learners can give students a sense of the processes that scientists and other scholars use to advance knowledge: They conduct individual and collaborative research, share ideas, and build on and critique one another's findings and conclusions. And in fact, participating in such communities appears to promote fairly complex thinking and knowledge-building processes, often for extended time periods (Engle, 2006; Scardamalia & Bereiter, 2006; Zhang et al., 2009). Participating in a community of learners can also be highly motivating for students, who may insist on going to school even when they're sick and are disappointed when summer vacation begins (Rogoff, 1994; Turkanis, 2001).

In addition to the cognitive and motivational benefits, working in a community of learners can foster positive peer relationships and social skills. It can also help create a *sense of community* in the classroom—a sense that teachers and students have shared goals, are mutually respectful and supportive of one another's efforts, and believe that everyone makes an important contribution to classroom learning.

You can learn more about creating a sense of community in Chapter 12.

A community of learners can be especially useful when we have a diverse student population (Kincheloe, 2009; Ladson-Billings, 1995b; Rothstein-Fisch & Trumbull, 2008).

Such a community values the contributions of all students, using everyone's individual backgrounds, cultural perspectives, and unique abilities to enhance the overall learning and achievement of the class. It also provides a context in which students can form friendships across the lines of ethnicity, gender, socioeconomic status, and disability—friendships that are critical for students' social development and multicultural understandings.

However, we must also note potential weaknesses of communities of learners, as well as of peer-group discussions more generally. Some students may dominate interactions, and others (e.g., English language learners) may participate very little or not at all (Walshaw & Anthony, 2008; White & Pea, 2011). Furthermore, some students may pass their misconceptions and personal biases along to their classmates (Brown & Campione, 1994; Hynd, 1998b; Smith & Conrey, 2009). Obviously, then, when we conduct classroom discussions or structure our classrooms as communities of learners, we must carefully monitor student interactions to make sure that everyone is meaningfully participating and that students ultimately acquire *accurate* understandings of the topic they're studying.

Cultures as Contexts

Learning Objective 9.3 Explain how learners' cultural backgrounds can influence their interpretations of new information and experiences; also explain how novice learners can effectively participate in one or more communities of practice.

Almost any longstanding social group develops some sort of **culture**, which includes the learned behaviors and beliefs that are passed from old members to new ones, from generation to generation. Through their culture, social groups ensure that each new generation acquires and benefits from the wisdom that preceding generations have accumulated. By passing along this collective knowledge, a cultural group increases the chances that it will survive and thrive for an extended period.

Especially in large, complex societies, people typically are exposed to and involved in two or more cultural groups simultaneously. For example, people who join the military are immersed in the culture (i.e., beliefs, behaviors, and traditions) of the military; people who belong to specific religious groups become immersed in those cultures as well. When we think about the students that we teach, we should be aware that each of them may be involved in and influenced by a variety of cultural groups, some of which overlap and some of which do not.

Some aspects of cultural knowledge are concrete and easily observable. Such is the case when people use paper and pencil, equations, diagrams, or computers to help them analyze data or solve problems. But other aspects of cultural knowledge are so abstract and pervasive that they're taken for granted and easily overlooked as contextual factors affecting learning. For example, consider the concepts *north, south, east*, and *west*. You've probably used these concepts frequently to help you find your way around the countryside or on a map. Despite their seemingly obvious relationship to Mother Earth, these concepts are creations that some cultures—and only some cultures—provide. It might surprise you to learn that different cultures even categorize *emotions* differently; for instance, people are less likely to distinguish among feelings of happiness, calmness, and pride if their culture's language doesn't have specific words for each one. Culture's influence on thinking and learning is so strong that researchers have observed cultural differences—small, subtle ones, to be sure—in brain organization and functioning (Barrett, 2017; Kitayama & Salvador, 2017; Park & Huang, 2010).

As people join and learn about various cultural groups, they usually ascertain that each culture prioritizes certain aspects of their culture. Consequently, young learners discover that certain things are especially important to think about and remember, and these things typically reflect the cultural group's perspectives and priorities. In fact, some researchers have suggested that the model of Information Processing Theory, that we discussed in Chapter 7, should be revised to acknowledge the overarching influence of cultural knowledge on all aspects of memory, perception, and cognitive processing (Kumar et al., in press). Cultures aren't static entities. Instead, they continue to change over time as they incorporate new ideas, innovations, and ways of thinking, particularly as members of one culture interact with other cultures (Hong & Cheon, 2017; Kitayama et al., 2007; Varnum & Grossman, 2017). Furthermore, there tends to be considerable variation in attitudes and behaviors within any particular culture; individual members may adopt some cultural values and practices but reject others (Bang, 2015; Markus & Hamedani, 2007).

Schemas, Scripts, and Worldviews as Aspects of Culture

As cognitive psychologists have suggested, developing learners draw on their experiences to construct **schemas** and **scripts**—general understandings of what things are typically like and how common activities typically unfold. Many schemas and scripts are unique to particular cultures. The exercise we present now illustrates this point.

You have previously learned about schemas and scripts in Chapter 7.

Experiencing Firsthand

The War of the Ghosts

Read the following story *one time only*:

> One night, two young men from Egulac went down to the river to hunt seals, and while they were there it became foggy and calm. Then they heard war-cries, and they thought, "Maybe this is a war-party." They escaped to the shore and hid behind a log. Now canoes came up, and they heard the noise of paddles, and saw one canoe coming up to them. There were five men in the canoe, and they said:
>
> "What do you think? We wish to take you along. We are going up the river to make war on the people."
>
> One of the young men said: "I have no arrows."
>
> "Arrows are in the canoe," they said.
>
> "I will not go along. I might be killed. My relatives do not know where I have gone. But you," he said, turning to the other, "may go with them."
>
> So, one of the young men went, but the other returned home.
>
> And the warriors went on up the river to a town on the other side of Kalama. The people came down to the water, and they began to fight, and many were killed. But presently the young man heard one of the warriors say, "Quick, let us go home: that Indian has been hit." Now he thought: "Oh, they are ghosts." He did not feel sick, but they said he had been shot.
>
> So, the canoes went back to Egulac, and the young man went ashore to his house, and made a fire. And he told everybody and said, "Behold, I accompanied the ghosts, and we went to fight. Many of our fellows were killed, and many of those who attacked us were killed. They said I was hit, and I did not feel sick."
>
> He told it all, and then he became quiet. When the sun rose, he fell down. Something black came out of his mouth. His face became contorted. The people jumped up and cried.
>
> He was dead.*

Now cover the story and write down as much of it as you can remember.

*Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology.* Cambridge, England: Cambridge University Press. Used with permission.

Compare your own rendition of the story with the original. What differences do you notice? Your version is almost certainly the shorter of the two, and you probably left out many details. But did you also find yourself distorting certain parts of the story so that it made more sense to you?

As a Native American ghost story, "The War of the Ghosts" may be inconsistent with some of the schemas and scripts you've acquired, especially if you were raised in a non–Native American culture. In an early study of long-term memory (Bartlett, 1932), students at England's Cambridge University were asked to read the story twice and then to recall it at various times later on. Students' recollections of the story often included additions and distortions that made the story more consistent with English culture. For example, people in England rarely go "to the river to hunt seals" because seals are saltwater animals, and most rivers have fresh water. Students might therefore say that the men went to the river to *fish*. Similarly, the ghostly element of the story didn't fit comfortably with the religious beliefs of most Cambridge students and so was often modified. When one student was asked to recall the story six months after he had read it, he provided the following account:

> Four men came down to the water. They were told to get into a boat and to take arms with them. They inquired, "What arms?" and were answered "Arms for battle." When they came to the battle-field they heard a great noise and shouting, and a voice said: "The black man is dead." And he was brought to the place where they were, and laid on the ground. And he foamed at the mouth. (Bartlett, 1932, pp. 71–72)

Notice how the student's version of the story leaves out many of its more puzzling aspects—puzzling, at least, from his own cultural perspective.

Determine whether students have appropriate schemas and scripts to understand the topic at hand.

When students from diverse cultural backgrounds come to school with somewhat different schemas and scripts, they may interpret the same information or activities differently, and in some cases may have trouble making sense of a particular lesson or reading assignment (Cole & Cagigas, 2010; Pritchard, 1990; Reynolds et al., 1982). As teachers, then, we need to find out whether students have the appropriate schemas and scripts to understand whatever topic we're teaching. When students *don't* have such knowledge, we may sometimes need to back up and help them acquire it before we forge ahead with new material.

Learners' schemas and scripts tend to be specific to particular topics. In contrast, their **worldviews**—their general beliefs and assumptions about how the world works—can influence their meaning-making in many domains (Koltko-Rivera, 2004; Lewandowsky et al., 2013). Following are examples of assumptions that a worldview might encompass:

- Life and the universe came into being through random acts of nature *or* as part of a divine plan and purpose.
- Objects in nature (rocks, trees, etc.) have some degree of consciousness *or* are incapable of conscious thought.
- Human beings are at the mercy of the forces of nature *or* should strive to master the forces of nature *or* must learn to live in harmony with nature.
- People are most likely to enhance their well-being by relying on scientific principles and logical reasoning processes *or* by seeking guidance and support from sources beyond the realm of scientific and logical thought.
- People's successes and failures in life are the result of their own actions *or* divine intervention *or* fate *or* random occurrences.
- The human world is fair and just—good deeds ultimately bring rewards; misdeeds are eventually punished—*or* is not necessarily fair and just. (Cole & Hatano, 2007; Evans et al., 2012; Furnham, 2003; Gifford, 2011; Hornsey & Fielding, 2017; Koltko-Rivera, 2004; Medin, 2005)

To a considerable degree, such beliefs and assumptions are culturally transmitted, with different cultures communicating somewhat different beliefs and assumptions either explicitly through their words or implicitly through their actions (Berti et al., 2010; Cole & Hatano, 2007; Kitayama, 2002; Losh, 2003).

Worldviews are often such an integral part of everyday thinking that people take them for granted and usually aren't consciously aware of them. In many cases, then, worldviews encompass *implicit knowledge* rather than explicit knowledge. Nevertheless, they influence students' interpretations of what they are learning in class. For example, if students believe that the world and its inhabitants are guided and protected by an omniscient and benevolent Greater Being, they're less likely to believe that global climate change is real or poses a significant threat to human society (Feinberg & Willer, 2011). And if students' culture consistently emphasizes the importance of accepting and living in harmony with nature as it is, they might struggle with a science curriculum that explores how human beings might manipulate and gain control over natural events (Atran et al., 2005; Medin, 2005).

In some cases, academic subject matter may conflict with students' most core beliefs—and ultimately with the very essence of who they are as individuals. For example, students who strongly believe in the divine creation of humankind may readily dismiss any suggestion that the human race has evolved from more-primitive species (Rosengren et al., 2012). And students whose cultures view certain historical battles as involving "good guys" versus "bad guys" may disregard more balanced perspectives in which each side had legitimate needs and concerns (Jacoby, 2008; Levstik, 2011; Porat, 2004). Hence, students' worldviews can sometimes interfere with their ability to undergo legitimate conceptual change. Under such circumstances, a more achievable goal may be to help students *understand* (rather than *accept*) academic scholars' explanations and lines of reasoning (Feinberg & Willer, 2011; Southerland & Sinatra, 2003). Overall, students tend to learn more when their teachers acknowledge and value the distinct worldviews that their students bring to the classroom (Del Toro & Wang, 2021).

When students' worldviews are central to their sense of identity, recognize that you may sometimes have to focus more on helping them understand—rather than accept—experts' explanations and lines of reasoning.

As teachers, we must remember that we, too, have certain worldviews—often implicit, below-the-surface ones—that influence what and how we think about our physical and social worlds. For example, we may place greater value on the importance of objective scientific investigations as a source of new knowledge than some of our students do (Thanukos & Scotchmoor, 2012). And many of us are apt to think that the practices of certain cultural groups are in some way inferior to those of mainstream Western culture (Banks et al., 2005). Difficult as it might sometimes be, we must continually reflect on our own cultural beliefs and acknowledge that they influence what and how we teach—sometimes for the better but sometimes to the detriment of our students' learning and development.

Communities of Practice as Aspects of Culture

As you may recall from Chapter 2, **procedural knowledge** refers to knowledge about how to do things (e.g., how to ride a bicycle; how to study for a test, etc.). When we think about the role of culture in student learning we must acknowledge that different cultures teach somewhat different kinds of *procedural knowledge.* Some procedural knowledge is task- or topic-specific and is conveyed directly and explicitly—for example, "Here's how to write a cursive *A*," and "Let me show you how to do long division." But cultures typically also pass along a good deal of procedural knowledge within the context of **communities of practice**—groups of people who share common interests and goals and regularly interact and coordinate their efforts in pursuit of those interests and goals (e.g., Hall & Jurow, 2015; Lave, 1991; Sawyer & Greeno, 2009; Wenger, 1998). Communities of practice tend to adhere to certain standards for action and interaction—standards that are often unwritten understandings rather than explicitly stated rules. For example, in the adult world of mainstream Western culture, people in various professions—medicine, law, scientific research, and so on—tend to communicate regularly with one another and to support one another in particular ways.

In most cases, new members of a community of practice learn acceptable ways of doing things primarily by actively *participating* in the group. Often, novices begin by participating only at the fringe of the group, perhaps by doing basic chores or by assisting or apprenticing with a more experienced group member. In other words, a novice is gradually introduced to the ways of the group through **legitimate peripheral participation**. Participation is *legitimate* in the sense that the novice contributes in genuine, authentic ways to the group's overall effort. It's *peripheral* in that it involves only small tasks at the outer edge, or periphery, of the action. As the newcomers acquire greater competence, they slowly take more central roles in various activities until, eventually, they are full-fledged participants (Lave & Wenger, 1991; Rogoff et al., 2007).

Communities of practice are evident in many cultures to which our students may belong. For instance, volunteer organizations (e.g., Habitat for Humanity, the American Red Cross) and organized youth groups (e.g., Boy Scouts, Girl Scouts) are essentially communities of practice as well. Families also function as communities of practice—the interactions that children have with each other and with their caregivers fosters the development of inquiry skills and knowledge in children. In one study, a researcher described the ways a family that placed great value on science acted as a community of practice through their regular interactions around science-related topics that emerged during their daily life. Family members had conversations about topics such as how a thermometer works, how to design a shelf, and the relationships between humans and bees. For example, in one interaction, Stuart (a preschooler) was playing with an air watergun; Stuart grunted while pumping the gun, so his dad took that as an opportunity to warn Stuart not to pump the gun too much, because it might make the watergun explode. Intrigued, Stuart asked how that could happen, giving his father an opportunity to explain how pressure could cause the plastic in the watergun to break. Stuart's father related this to a recent incident in which the family washing machine broke because there were too many clothes in it at once (Keifert, 2021, p. 254). Regular interactions around science-related topics with family members may positively affect Stuart's knowledge, motivation, and inquisitiveness regarding science.

Schools, too, are communities of practice, in that they have certain prescribed ways of doing things to accomplish particular goals—for example, following schedules, completing assignments, and meeting deadlines. We teachers must certainly help students learn the expectations of their educational community. But in addition, we can help students learn the ways of various adult professional communities, and of the adult world more generally, by having students actually participate in adult-like activities—perhaps by encouraging part-time internships with local businesses or collaborative efforts with public service organizations. For example, students at a certain high school in Ohio must spend a full week, during the Spring semester, focusing on an experience outside the boundaries of their school's regular academic curriculum. One of the students who attended the school apprenticed at an expensive restaurant for a week. She performed such menial tasks as washing spinach and chopping vegetables while also talking with the kitchen staff about what it would be like to work full time in a restaurant. (In her case, the experience convinced her that a career in the culinary arts probably wasn't in her future.)

Encourage involvement in local businesses and public service organizations as a way of introducing students to the skills and commonly accepted practices of the adult world.

Societies as Contexts

Learning Objective 9.4 Describe key elements of society that impact learning and explain how authentic activities can enhance learners' performance in their out-of-school lives.

A concept related to culture, but also somewhat distinct from it, is **society**: a very large, enduring social group that has fairly explicit social and economic structures, as well as collective institutions and activities. For instance, virtually any nation is a society, in that it has a government that regulates some of its activities, laws identifying permissible and unacceptable behaviors, and a monetary system that allows members to exchange goods and services.

A society influences its members' learning in a variety of ways, including through the resources it provides, the activities it supports, and the general messages it communicates (e.g., Bronfenbrenner, 2005; Gauvain & Munroe, 2009). For example, a society's hospitals, schools, social service programs, and libraries enhance members' physical and personal growth and well-being. And the media (newspapers, television, the internet, etc.) convey information, ideas, opinions, and messages (often subtle ones) about desired behaviors and group stereotypes.

One noteworthy aspect of any society is its **distributed knowledge**: Different people have expertise in different topics, and thus society members must rely on one another in order to maximize both their individual success and the success of the overall group. To effectively participate in society, people must learn how to seek out the expertise they may occasionally need to tackle challenging problems (Bromme et al., 2010; Woolley, 2015).

In many societies, formal schooling provides a key means by which the society passes along some of its collective knowledge to the next generation; in doing so, the society paves a pathway for some members to pursue the in-depth study and practice opportunities essential for gaining expertise in a particular content area. Ideally, formal schooling also teaches skills for locating and critiquing important information and ideas that exist in either paper or digital form in the society's distributed knowledge base. And schools must ensure that their students can ultimately *use* what they're learning in their adult personal and professional lives—for instance, by engaging students in *authentic activities*.

Authentic Activities

Authentic activities are similar or identical to those that students will eventually encounter in the outside world. Such activities can have several benefits. For one thing, by working in real-world contexts, students should be able to accomplish more than they would when performing relatively artificial and simplistic classroom tasks. Second, authentic tasks are likely to promote meaningful learning rather than rote memorization of new information and procedures. Finally, because they resemble real-world tasks and problems, authentic activities should help students make mental connections between school subject matter and out-of-school situations, and these connections should help students retrieve and apply—that is, *transfer*—what they've learned to new settings and problems.

See Chapter 8 for a discussion of factors affecting transfer.

Authentic activities can be developed for virtually any area of the curriculum. For example, we might ask students to do the following:

- Write an editorial
- Participate in a debate
- Design an electrical circuit
- Conduct an experiment
- Write a computer program or develop an "app"
- Create and distribute a class newsletter
- Perform in a concert
- Plan a family budget
- Converse in a foreign language
- Make and edit an instructional video
- Construct a museum display
- Develop a webpage

In some instances, authentic activities take the form of **problem-based learning** or **project-based learning**, in which students acquire new knowledge and skills as they work on complex problems or projects similar to those they might find in the outside world. Sometimes authentic activities may also involve **service learning**—that is, they involve projects that directly or indirectly enhance the quality of life in the outside

Incorporate classroom subject matter into real-world tasks.

community. To be effective in enhancing students' learning—and to be sources of pleasure and success rather than sources of frustration and failure—most complex authentic activities require considerable teacher guidance and support (Hmelo-Silver et al., 2007; Mergendoller et al., 2006).

Authentic activities can be highly motivating for students (Barnett, 2005; Marks, 2000; Wirkala & Kuhn, 2011). As an example, consider one high school student's recollection of a ninth-grade moon-tracking activity:

> It was the first time I can remember in school doing something that wasn't in the textbook… like we were real scientists or something. We had to keep data sheets, measure the time and angle of the moonrise every day for a month. It drove my mom nuts because sometimes we'd be eating dinner, and I'd look at my watch and race out the door! We had to measure the river near us to see how it was affected by the moon… I went down to the river more than I have in my whole life, I think. Then we had to do the calculations, that was another step, and we had to chart our findings. The test was to analyze your findings and tell what they meant about the relationship of the tides and the moon.… I felt that I did something real, and I could see the benefit of it. (Wasley et al., 1997, pp. 117–118)

By placing classroom activities in real-world contexts, we help students discover the reasons why they're learning various topics. Authentic activities may be especially valuable in working with students who are at risk for academic failure (Anderson & Pellicer, 1998; Christenson & Thurlow, 2004; Tate, 1995). Authentic activities are possibly most beneficial when they promote complex thinking skills—for instance, synthesizing information, formulating and testing hypotheses, or solving problems—and when their final outcomes are multifaceted and somewhat unpredictable (Newmann & Wehlage, 1993; Paris & Turner, 1994). Nevertheless, the activities should be sufficiently simple that they don't impose an unmanageable cognitive load—in other words, they shouldn't be so complex that students find them overwhelming (Kester et al., 2010; Plass et al., 2010). And we shouldn't assume that all students will perceive an activity as being authentic. Students' personal experiences and cultural backgrounds need to be considered. An activity that is highly authentic to some students might be quite unusual for other students.

See Chapter 4 for a discussion of culturally responsive teaching.

The Into the Classroom feature "Conducting Authentic Activities" offers several strategies that researchers and experienced educators have found to be effective.

Into the Classroom

Conducting Authentic Activities

- **Simplify the task sufficiently to be appropriate for students' age levels and cognitive abilities.**

  At a school in Seattle, Washington, students in kindergarten and the first and second grades work cooperatively with researchers to monitor dog "poop" along a nature trail in an important watershed area. Once every 2 months, the students and several adult volunteers count and map the various dog deposits they find on the trail and within 7 feet to either side. Midway through the school year, the students place plastic-bag dispensers at various locations near the trail and continue their bimonthly monitoring in order to determine whether the dispensers and bags have any effect. Not only do the students gain an awareness of the harmful effects of pollution on natural resources, but they also gain confidence in their ability to have a positive impact on the health of their local environment.

- **Choose a task that requires students to integrate and apply what they've learned in two or more subject areas.**

  A third-grade class creates a "publishing company" that provides a variety of printed materials (announcements, programs, banners, etc.) for activities and performances throughout their school. Students engage in many typical business activities; for instance, they interview for various jobs in the company, make sales calls to solicit business from other classes, design customer order forms, edit and proofread their work, and conduct customer satisfaction surveys.

- **Communicate that there is no single best or right approach or solution for a task.**

  A teacher of a high school life skills class gives students a list of prices of many items (meats, fruits, vegetables, milk, etc.) available at the local grocery store. Using the list, the food pyramid, and a budget of $30, students must plan a healthful breakfast, lunch, and dinner for a family of four for one day.

- **Encourage students to experiment with new ideas and strategies.**

  A fifth-grade class has been studying a number of common plants and animals indigenous to their area. The students work in groups of two or three to create informational displays about several species for the city museum. Their teacher helps each group brainstorm ideas about how it might effectively portray a particular plant or animal for the general public.

- **Coordinate efforts with local community agencies.**

  Thanks to a local community center, some high school students in a low-income inner-city neighborhood participate in an ongoing "bicycle workshop" in which they construct their own bicycles from various donated and discarded bicycle parts. Under adult guidance and support, the teens subsequently become actively and meaningfully involved in a large planning project aimed at enhancing local transportation networks in and around the neighborhood. Project participants travel both on foot and by bicycle throughout the neighborhood and use global positioning system (GPS) technology to collect data about personal preferences and mobility issues. The participants then create maps of their findings; for example, one tenth grader maps possible bike lanes that can facilitate travel to the city college she hopes to attend after graduation. Project participants eventually share their maps with city officials and urban planners, whose follow-up actions (e.g., adding bike lanes and informative street signs) significantly improve the lives of residents.

- **Communicate high expectations for students' performance but provide enough scaffolding to ensure students' success.**

  All 92 eighth graders at a middle school are required to contribute in a meaningful way to the annual eighth-grade musical. Some students are members of the cast, whereas others are involved in scenery construction, costume design, or lighting. Faculty supervise each aspect of the project and provide guidance and assistance as needed, but the students are largely responsible for the quality of the production. As students from different social groups work with one another, social barriers and ill feelings between popular and unpopular students begin to break down. By opening night, the class has acquired a sense of cohesiveness and overall class spirit, and collectively the students take much pride in their successful production.

SOURCES: Edelson & Reiser, 2006; Hall & Jurow, 2015 (bicycle workshop example); Hmelo-Silver et al., 2007; Imuta et al., 2018; Kester et al., 2010; Kornhaber et al., 2004 (publishing business example); Mergendoller et al., 2006; Newmann & Wehlage, 1993; Paris & Turner, 1994; Pickens, 2006 (dog poop example); Plass et al., 2010; Thompson & Grace, 2001 (class play example).

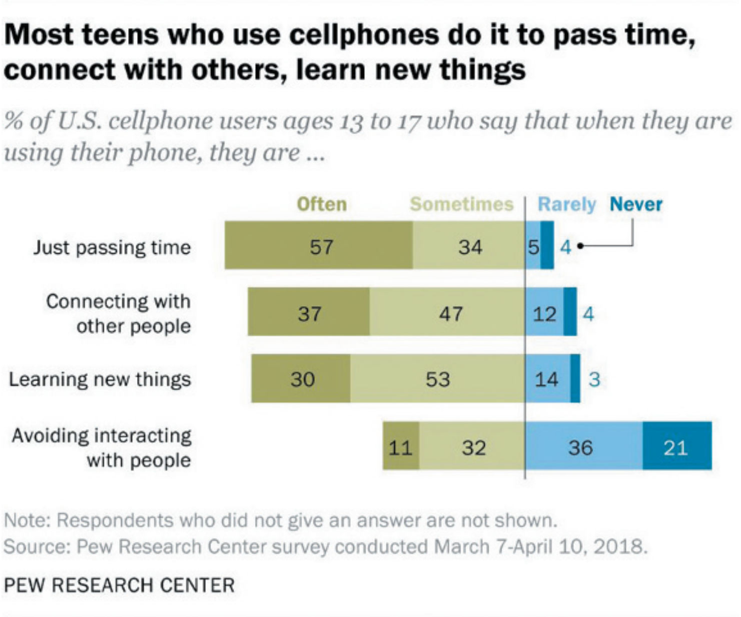
Digital Technologies as Contexts

Learning Objective 9.5 Describe the unique roles that digital technologies and the internet can play in classroom instruction.

Technology as a context for learning became almost universal with the onset and duration of the Covid-19 pandemic. Whereas technology was certainly used by educators to varying degrees prior to the pandemic, usage has grown exponentially in recent years.

In this section, we will focus on *digital technologies*—technologies that enable us to electronically store, manipulate, and transmit information. (The word *digital* refers to the fact that the information is stored in the form of many, many 0s and 1s, collectively known as *bits*.) Computer hardware and software, smartphones, video game systems, and the internet are all examples of digital technologies. As these technologies have become more widely available and affordable, they've become pervasive. For example, in the United States, the vast majority of high school students have smartphones, and most of them are proficient in using their phones to communicate with their friends through a variety of platforms, take and send photographs, and post opinions and photos on social networking sites such as Snapchat, Instagram, and Twitter. Adolescents use smartphones for a variety of reasons, with many adolescents indicating that they use these devices simply to pass time (see Figure 9.2). Other reasons include interacting with friends, learning new things, and avoiding having to interact with other people (Ito et al., 2009; National Center for Education Statistics, 2018; Pew Research Center, 2019; Valkenburg & Peter, 2009).

Figure 9.2 *Reasons why adolescents use cell phones.*



SOURCE: Most U.S. teens who use cellphones do it to pass time, connect with others, learn new things, Pew Research Center, Washington, D.C., AUGUST 23, 2019, https://www.pewresearch.org/fact-tank/2019/08/23/most-u-s-teens-who-use-cellphones-do-it-to-pass-time-connect-with-others-learn-new-things/#:~:text=Nearly%20all%20U.S.%20teens%20(95,use%20their%20phone%20too%20much

Technology has enabled people around the world to access that *distributed knowledge* of which we spoke earlier. Gone are the days when quick access to information required people to either (a) effectively store it in their own long-term memories or on personal bookshelves or (b) travel to a public library or other physical source of knowledge to learn more about a particular topic. Instead, people can gain needed information about almost any subject area—and sometimes they gain *mis*information—with a few simple keystrokes on an internet search engine such as Google, Bing, or Yahoo!

Technology in Learning and Instruction

When learning takes place in an electronic environment, it's sometimes called **e-learning** or online learning. But regardless of what we call it, the many technologies available in 21st-century societies can enhance learning in numerous ways:

- *Instruction can seamlessly integrate several media and multiple pedagogical strategies.* For example, instructional software programs often integrate written text with graphics, videos, simulations, exercises, and assessments. And *interactive smartboards*—large wall-mounted displays connected to a computer—are increasingly replacing traditional chalkboards and whiteboards. Not only can these boards display the contents of a computer screen—perhaps a video, a set of instructions, or the contents of a website—but in addition, students can electronically write and draw on them, with the products being transmitted to and saved on a computer or to a cloud.

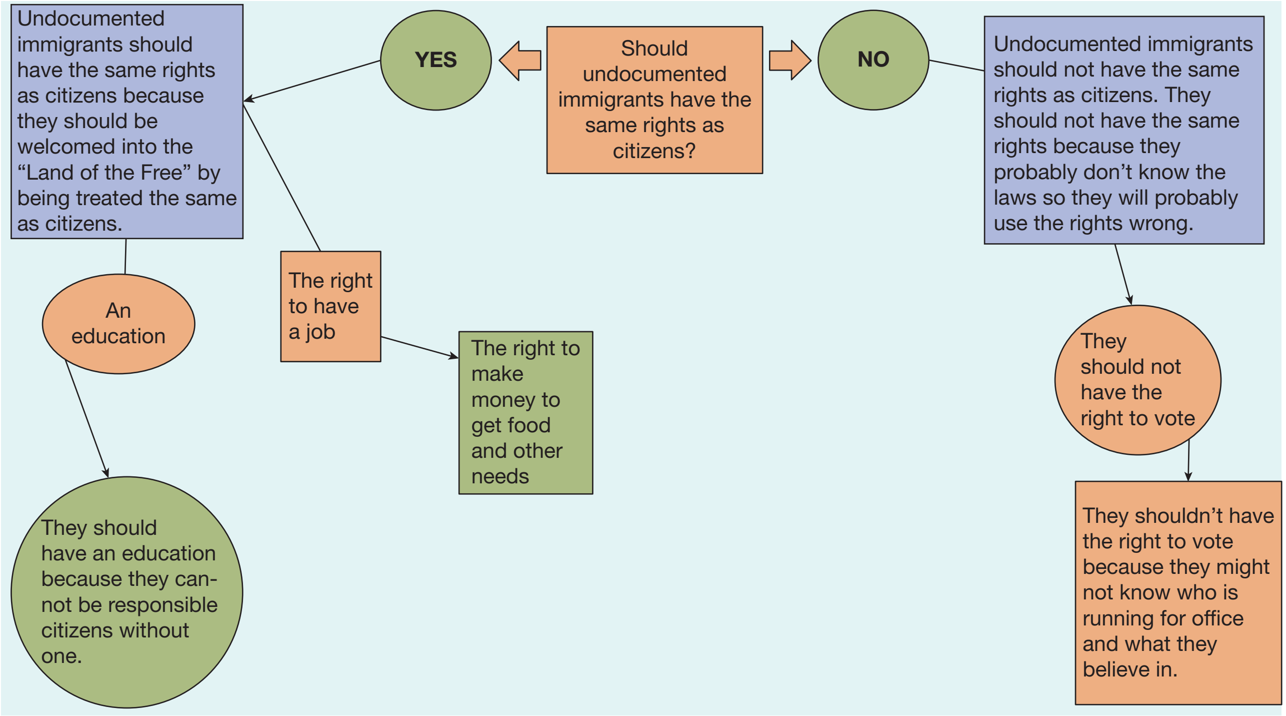
  Even many textbooks (including this one!) take a digital form these days. Digital textbooks might include not only traditional text and graphics but also links to videos, audio recordings, practice and application exercises, and links to glossary entries. Students can electronically "search" for particular words or concepts, highlight sections of particular interest or importance, and add notes related to the content.
- *Instruction can more easily be individualized to accommodate students' unique needs.* For example, internet-based research projects allow students to pursue topics of personal interest in considerable depth. And *intelligent tutoring systems* help students master knowledge and skills in various content domains—for instance, in reading, math, and science—by giving them ongoing, individually tailored guidance, hints, coaching, and feedback as they study new concepts and procedures.

You can find examples of intelligent tutoring systems in Chapters 7 and 8.

- *Instruction can be delivered from anywhere via the internet.* For example, students can participate in classroom activities when they must be absent from school for extended periods, perhaps because of a chronic illness or significant injury. Also, students can take courses that aren't available in their local school districts—perhaps Advanced Placement high school courses or college coursework appropriate for their ability levels, or even a course that is being offered in a foreign country.
- *Learners can manipulate data in a variety of ways while also keeping their cognitive load within reasonable limits.* As teachers, we must remember that complex thinking tasks can impose a burden on working memory. Consistent with the notion of *distributed cognition*, digital technologies can carry some of the cognitive burden and free up some working memory capacity for problem solving and creativity. For example, students can use spreadsheets and graphing software to explore the effects of different values of x in an algebraic equation. And they can use concept-mapping software such as Coggle, Kidspiration, or Lucidchart—sometimes called *mind-mapping* programs—to try out various ways of organizing and interrelating new material. Students also can collaborate with each other using various written and visual images through shared online bulletin board-type applications, such as Google Jamboard, Google Slides, or PowerPoint. Figure 9.3 is an example of an assignment in which fourth graders worked collaboratively in a small group to address a controversial question (*Should undocumented immigrants have the same rights as citizens?*) during a unit on immigration. Ideally, technology can provide an electronic "playground" in which students can experiment with and expand on ideas (Langer, 2011; Spiro & DeSchryver, 2009).
- *Teachers and students can easily communicate and collaborate with one another.* Technology can certainly enhance communication and collaboration. For example, course management systems such as Blackboard and Schoology provide means through which teachers can post materials and assignments, students can upload their work for feedback or evaluation, and all class members can regularly interact through discussion boards or chat rooms. Other good resources include Google for Education (edu.google.com) and Google Classroom (classroom.Google.com), through which schools can post classroom

Consider the many ways in which technology might help students think more creatively and resourcefully about complex issues and problems.

Figure 9.3 Collaborative use of technology to produce a concept map.


Undocumented immigrants should have the same rights as citizens because they should be welcomed into the "Land of the Free" by being treated the same as citizens.
YES
Should undocumented immigrants have the same rights as citizens?
NO
Undocumented immigrants should not have the same rights as citizens. They should not have the same rights because they probably don't know the laws so they will probably use the rights wrong.
An education
The right to have a job
The right to make money to get food and other needs
They should not have the right to vote
They should have an education because they cannot be responsible citizens without one.
They shouldn't have the right to vote because they might not know who is running for office and what they believe in.

SOURCE: DCL Year 1 Unit 1 Desi Day 9

Activity developed by Kimiko Ching, Adriana Martinez, and Shantanu Tilak.

Set up internet websites that foster ongoing classroom communication both in and outside of school.

calendars with scheduled activities and due dates, and upload documents to which teachers and students alike can contribute. In addition, teachers and their students can create one or more class-specific *wikis*, websites on which individual class members can add to, edit, or rearrange material previously contributed by other members.

Thanks to the internet, individual students or entire classes can also communicate and collaborate with students or classes in other locations—even in other countries (e.g., see iEARN.org). The increased use of video communication tools such as Zoom and FaceTime easily allow students to interact and collaborate with youth literally anywhere in the world. And teachers are increasingly communicating and collaborating with *one another* via the internet. For example, many teachers share lesson plans and other instructional materials they have found to be effective (e.g., see www.ck12.org and www.oercommons.org).

- *Technology offers many means of providing authentic activities.* Examples include creating class newsletters, videos, or video games (e.g., see sploder.com and scratch.mit.edu). Also, students can post short stories, artwork, or music online for people elsewhere to critique. And through well-designed simulations, they can design and carry out virtual scientific "experiments" to test their theories about cause-and-effect relationships in the physical world.
- *Some technology-based instructional strategies effectively blur the lines between "work" and "play."* Well-designed technology-based instruction is highly interactive and can keep students motivated and engaged for lengthy periods. And some educators and software developers have been creating challenging video games that electronically immerse students in simulated environments in which they act as, say, tribal chiefs in 4000 BC, modern-day explorers of ancient Mayan ruins in Mexico, or wolves trying to survive and thrive in Yellowstone National Park (in *Civilization*, *Mayan Mysteries*, and *Wolf Quest*, respectively). In the process of playing these games, students can learn a great deal about history, science, and other domains. Also, students can acquire athletic skills and develop physical fitness through hardware and software in which they virtually engage in such activities as dancing, tennis, and baseball—an approach that's sometimes called *exergaming* (Shayne et al., 2012).

General Guidelines for Using Technology Effectively in Instruction As we incorporate digital technologies into instruction, we must give students the support and guidance they need to use these tools effectively. Following are several general suggestions:

- Don't assume that instruction is better because it involves technology. Instead, make sure that the technological tools you use *enhance* students' thinking and learning in some way.
- Apply the same general principles you would use in traditional instruction—for instance, activating students' prior knowledge, encouraging meaningful rather than rote learning, and posing questions and tasks that require students to mentally and/or physically respond to the material in some way.
- Structure activities so that students aren't easily distracted by irrelevant information and activities (e.g., clicking on unproductive links).
- Teach and insist on appropriate social etiquette for cross-communication—you might use the term "Rules for Interaction"—and monitor students' entries for content; especially be on the lookout for bullying and other antisocial messages.

Promoting Technological Literacy

We must remember, too, that the use of digital technologies and the internet requires a specific body of knowledge and skills, collectively known as **technological literacy**. Following are examples of what technological literacy includes:

- *Use of device-specific operating systems.* Most learners who have cell phones know such basics as how to make a call, send a text message, or add a friend's contact information. But to be technologically literate in the 21st century, students must also acquire some basic skills and strategies that facilitate the use of technology.

- *Use of common functions.* Some functions are essential in using a wide variety of applications. For example, learners must know how to "open," "cut," "paste," and "save" and "save as," and how to search for desired information in a file.
- *Use of specific applications.* For example, word-processing software, spreadsheets, and presentation software (e.g., PowerPoint) are now commonplace in many elementary and secondary classrooms. And various internet-based communication applications—such as email, chat rooms, discussion boards, blogs, and wikis—all involve not only basic reading and writing skills but also application-specific knowledge.
- *Effective search for relevant and credible internet websites.* Learners must know how to use internet search engines and identify appropriate keywords to initiate a search. They must be able to determine whether particular websites are relevant or irrelevant to particular tasks and questions. They must critically evaluate each website they find in order to make reasonable judgments about the validity of its content. And they must often pull together what they learn from various sources into an integrated, organized whole.

Perhaps through past experiences with cell phones, video games, or home computers, many students come to school with some of these skills. Yet others may not have the basics; for instance, they may not know how to turn on a particular device and adjust the volume to a comfortable level. Obviously, we teachers must determine and teach whatever basic technological knowledge and procedures students haven't yet acquired.

Remember that some students may lack basic skills related to digital technologies.

Even students who seem to be technologically sophisticated may lack all the cognitive skills they need to *learn* effectively from technology. Learning from websites can be especially problematic for them, for several reasons. First, they may have trouble sorting through the hundreds of sites that an internet search yields in order to determine which ones are truly relevant to their questions and needs. Second, they may not have the knowledge and skills they need to discriminate between sites that present objective information, on the one hand, and those that convincingly offer biased social or political propaganda, on the other. Third, they may not know how to effectively utilize the various sources of information and communication tools with a given website. Students need the same support in using effective self-regulation strategies when they are learning with technology that they do in other learning contexts. For example, students may need support in organizing and synthesizing the separate bits of information they've found on various sites. Finally, they may not have the self-motivating "stick-to-it-iveness" that lengthy and occasionally frustrating internet searches can involve (Afflerbach & Cho, 2010; Hartley & Bendixen, 2001; Leu et al., 2009; Manning et al., 2011).

Some of these skills involve *critical thinking* (see Chapter 8). The final one—"stick-to-it-iveness"—involves *self-regulation* (see Chapter 8).

Clearly, students often need considerable scaffolding as they conduct online research, especially with regard to the *metacognitive* strategies they should use in the process. Following are a few suggestions:

- Use a database or search engine that restricts the websites to which students have access (e.g., EBSCO Information Services' "Searchasaurus" search engine).
- Provide specific questions students should try to answer as they search for information online.
- Also provide questions students should consider in evaluating the credibility of a website's content (e.g., "Does a reputable organization sponsor the website?" "What evidence supports this point of view?").
- Give students structured practice in comparing and contrasting websites that present diverse and possibly contradictory perspectives.
- Ask students to write summaries of what they've learned from multiple websites, perhaps in collaboration with peers (Afflerbach & Cho, 2010; Alexander & the Disciplined Reading and Learning Research Laboratory, 2012; Bromme et al., 2010; Gil, Bråten et al., 2010; Manning et al., 2011; Wiley et al., 2009)

Scaffold students' early research on the internet and monitor their explorations to ensure that they don't venture into inappropriate websites and subject matter.

In doing these things, we enhance students' general **information literacy**—their knowledge and skills related to finding, using, evaluating, organizing, and presenting information acquired from diverse sources.

Online Learning

When Covid-19 emerged, educators and students around the world suddenly were forced to engage in instruction via the internet. Collectively, such instruction is known as online learning; you may also see such terms as *distance learning* and *web-based learning*. The world has changed as a result of the pandemic, and online learning is now used more often than in the past. For example, whereas until recently, schools almost always cancelled classes due to inclement weather, schools now have the option of switching to an online format if needed. And now that both students and teachers are more confident in using digital technologies, online learning is being used more regularly for a variety of purposes. We've also learned a lot from the experiences that educators have had with online learning over the past few years. For example, we've learned that whereas we can provide students with opportunities to work at their own pace and to make choices about what and how they learn (which can greatly enhance motivation, which we'll discuss in Chapters 10 and 11), we've also learned that some students need support and assistance in managing their time and making such choices (Abramson, 2021). To facilitate this, educators in K–12 schools can:

- Gear instruction to students' current ability levels (e.g., with some students working on fundamental knowledge and skills and other students pursuing advanced content)
- Tailor instructional strategies to match students' unique needs (e.g., by providing more or less scaffolding based on how successfully each student is progressing)
- Provide opportunities for students to apply classroom subject matter to complex, semi-authentic simulations
- Create settings in which students collaborate with one another as they work on projects and learning activities
- Provide entire courses in certain subject areas
- Provide a means through which low-achieving students can retake and pass courses they have previously failed
- Provide an entire school curriculum (e.g., for students who are home-schooled and/or live in remote locations)

The effectiveness of online instruction depends on a number of factors (Means et al., 2014). Students must have sufficient prior knowledge about the subject matter to make sense of the new material, sufficient technological literacy to engage easily with the internet and specific software systems being used, and sufficient self-regulation skills to get and keep themselves on task. The instructional program should frequently assess students' progress and areas of difficulty, adjust instruction accordingly, and give constructive feedback. Online learning is particularly effective when the system requires students to regularly *interact* with the system—certainly with the content (e.g., by responding to questions) and perhaps also with a live or virtual teacher and with one or more peers (Bernard et al., 2009; Means et al., 2014).

The teacher plays a significant role in making online learning effective. As educators we need to still attend to many of the same instructional practices that we utilize in face-to-face classrooms. In particular, when our students are learning online, we must remember to (a) make extra efforts to develop and build our relationships with our students, (b) emphasize the relevance of the topics that students are learning about, and (c) help our students to establish routines that will help them to be successful (i.e., help them to use appropriate self-regulation strategies when learning online) (Anderman & Xie, 2020; Devolder et al., 2012; Eccles & Wigfield, 2020).

As a stand-alone means of delivering instruction, online learning seems to be, on average, neither better than nor worse than traditional instruction. However, a well-integrated *blend* of face-to-face and online instructional methods can definitely enhance students' overall achievement in comparison with traditional approaches (Means et al., 2014). For example, having some students work online to study particular topics can occasionally free us up to work with other students either individually or in small groups. Alternatively, we might provide face-to-face instruction in key concepts and procedures in math or science and then have students apply these concepts and procedures to semi-authentic virtual tasks and problems. And in general, having students simultaneously work in both classroom and online environments enables us to give whatever assistance and encouragement individual students might need to gain maximum benefits from their online experiences.

Taking Student Diversity into Account

Throughout this chapter we have emphasized that social contexts affect our students' learning. But do these contexts affect all of our students in the same ways? At the beginning of the chapter, Jordan and David expressed different opinions about the responsibilities of governments with regard to supporting new immigrants; Jordan's opinion in particular was probably influenced by his personal experiences knowing families that had experienced economic hardships. Jordan and David seem to have grown up in different neighborhoods, and their experiences living in those neighborhoods impacted the ways that they made sense of new content that they learned about in school. As educators, we must be mindful of the contexts within which our students live and interact. Their homes, cultures, ethnicities, and religions (in addition to many other contexts) affect their worldviews, and how they learn at school. When we acknowledge that these contexts are intricately intertwined in how our students learn, we are acknowledging that all learning is social in nature and is affected by culture (Tomasello, 2016).

Some of our students may have lived for most of their lives in similar contexts (e.g., many may have grown up in the same neighborhood), but all of them also have experienced different contexts that have certainly influenced them. For example, Tara and Anna are two third graders in the same class, who have lived in the same neighborhood since they were born. Their teacher, Mrs. Reynolds, might assume that Tara and Anna have been influenced in similar ways by their experiences of living in the same neighborhood.

Although they do live in the same area, Tara's and Anna's experiences have actually been quite different. Tara lives with her mother, her father, and her brother. Tara's father works as the manager of a local restaurant, and her mother does not work because she wants to (and can afford to) stay home and take care of Tara's little brother. Tara has her own bedroom, as does her younger brother. Tara's family is originally from Puerto Rico, and the family loves to make Puerto Rican food and to visit their many cousins in Puerto Rico every summer. Anna lives with her father and her grandmother; Anna's mother died when Anna was very young. Anna's father teaches math at the local high school, and Anna's grandmother is home all the time because she is retired, and she can't afford to live by herself. Anna has to share a bedroom with her grandmother. Anna's family is from Italy. Anna loves that her grandmother cooks the most delicious Italian food most nights, and often tells Anna animated stories about her childhood growing up in Rome.

Although Tara and Anna live in the same neighborhood, they have very different experiences at home. The contexts in which Tara and Anna live differ in a number of ways, including guardianship (Tara has a two-parent family whereas Anna has a single parent and grandmother), siblings (Tara has one brother, Anna is an only child), and cultural heritage (Tara's family is Puerto Rican, Anna's family is Italian). Although these two students live in the same neighborhood, they experience numerous distinct contexts that teachers may not be aware of.

Such differences, which may seem subtle to a teacher, are very impactful in our students' lives, and affect their experiences in school. From the teacher's perspective, it's sometimes convenient to see the classroom as a consistent context that all students experience in the same way. But students interpret and experience classroom contexts differently, depending on the larger contexts of their lives. To illustrate this, consider that some school policies, aimed at the entire student body, may be interpreted in very different ways by students within the same school. For example, some schools have dress codes that prohibit certain hairstyles; such policies have signaled to Black students that the natural state of their hair is unacceptable in an educational environment, and that students must change the way that they are (i.e., their hair) in order to be seen as a legitimate student in their schools (Gray et al., 2018).

Gender also affects how students in the same classroom experience learning. As humans, we experience the world differently depending on our gender identities. For example, in one study, researchers found that girls and boys in the same high school physics, chemistry, and engineering classes had quite different experiences. The girls perceived their science teachers as providing less support than did boys, and the girls were less likely to feel that their needs were being met in those classrooms (Patall et al., 2018).

Cultural differences also affect our students' experiences. Some students who have lived in different cultures may hold different worldviews from other students. Indeed, they may not share the same scripts and schemas with regard to classroom practices as do some of their peers. For example, it is not atypical in some Nordic countries (e.g., Finland, Sweden, and Iceland) for students to call their teachers by their first names (Zwickert, 2017). A student who moves from one of these countries to the United States may take some time to adjust to addressing teachers in a more formal manner and might be inclined to call Mr. Jones "Jack" or Ms. Adams "Carolyn" at first.

Many students with special needs have difficulties with learning activities in classroom and online contexts. Chapter 5 identifies specific categories of special needs that fall within the five general categories listed in Table 9.2.

STUDENTS IN INCLUSIVE SETTINGS

Table 9.2 Facilitating Learning in Various Contexts for Students with Special Educational Needs

Category	Characteristics You Might Observe	Suggested Strategies
Students with specific cognitive or academic difficulties	• Difficulties in completing assignments independently in certain classes • Less proficiency in learning from the internet, due to poor literacy skills • Tendency to focus on mechanics (rather than meaning) when revising written work • Greater-than-average difficulty learning and remembering basic facts in math, science, and social studies	🍏 Model self-regulatory strategies and provide guided practice and plenty of time for students to feel confident about using these strategies independently. 🍏 Provide extra scaffolding for paper-based and electronic assignments (e.g., shorten assignments, identify main ideas, have students look for answers to specific questions). 🍏 Use concrete manipulatives that students regularly encounter in their homes and neighborhoods. 🍏 Allow students to work collaboratively with their peers, particularly peers who may have a bit more expertise with the topic.
Students with social or behavioral problems	• For some students, achievement two or more years below grade level in one or more content domains	🍏 Help students to develop social skills that will help them to work collaboratively, effectively, and quietly across different classroom contexts. (Also use strategies listed for students with specific cognitive or academic difficulties.)
Students with general delays in cognitive and social functioning	• Smaller-than-average knowledge base to which new information can be related • Difficulty remembering basic facts • Lack of learning strategies such as rehearsal or organization • Reasoning abilities characteristic of younger children (e.g., inability to think abstractly in the secondary grades)	🍏 Provide experiences, across diverse contexts, that help students learn the basic knowledge and skills that other students may have already learned on their own. 🍏 Use positive reinforcers to reward students' correct responses; over time, gradually lessen their dependence on these reinforcers. (Also use strategies listed for students with specific cognitive or academic difficulties.)
Students with physical or sensory challenges	• Less awareness of the conventions of written language, especially if students have visual impairments • Fewer outside experiences and less general world knowledge on which instruction can build	🍏 When students have difficulty with motor coordination, allow them to dictate their stories and compositions. 🍏 Conduct demonstrations and experiments to illustrate basic scientific concepts and principles. 🍏 Use drama and role-playing to illustrate historical events. 🍏 For students with limited vision, enlarge images and provide assistive technologies for online learning (e.g., screen-reading software).
Students with advanced cognitive development	• Advanced reading comprehension skills • More sophisticated writing abilities • Greater ability to construct abstract and integrated understandings	🍏 Form study groups in which students can pursue advanced topics in particular domains. 🍏 Encourage students to work collaboratively on interdisciplinary projects that allow them to think "out of the box."

SOURCES: Beike & Zentall, 2012; Curtis, 2004; De La Paz & McCutchen, 2011; Ferretti et al., 2000; Geary et al., 2012; Gregg, 2009; Hallahan et al., 2015; Hallenbeck, 1996; Hulme & Joshi, 1998; Lovett et al., 2017; Mastropieri & Scruggs, 1992, 2000; Page-Voth & Graham, 1999; Piirto, 1999; Rayner et al., 2001; Salend & Hofstetter, 1996; Sampson et al., 2007; H. L. Swanson et al., 1998; Tompkins & McGee, 1986; Turnbull et al., 2016; Wood et al., 1998.

Chapter 9 What Have You Learned?

As a way of reviewing and summarizing the chapter's discussions of various contexts for learning, let's now return to the chapter's learning objectives.

9.1 Describe five basic assumptions underlying contextual theories of learning and apply these assumptions to classroom practice. Thinking and learning always take place within certain contexts; in particular, they're inextricably intertwined with the learner's immediate physical and social environment, and broader culture and society. Taken as a whole, contextual theories rest on at least five assumptions. First, the brain functions in close conjunction with the rest of the body—for instance, with one's sensory systems. Second, acquired knowledge and skills are often linked to, or *situated* in, specific activities and environments. Third, learners frequently think and perform more effectively when they can offload, or *distribute*, some of their cognitive burden onto physical objects, symbolic systems, or other people. Fourth, learners are sometimes more effective when they collaborate with other people; such collaborative efforts can take place either at a single point in time or sequentially over a lengthy period. And fifth, learners benefit greatly from the collective wisdom of their culture and society.

9.2 Contrast the benefits of expert–novice interactions with the benefits of peer interactions; explain how you might enhance students' learning through both kinds of interactions. Learners gain many benefits from the guidance of teachers and other more advanced individuals. Such individuals can *mediate* new experiences for learners, helping them attach meaningful concepts, principles, and other productive interpretations to what they see and hear. These individuals also introduce learners to new cognitive and metacognitive strategies and scaffold learners' efforts to use them effectively. Interactions with peers have a different set of advantages. For example, when equal-ability learners collaboratively discuss and apply new subject matter, they must clarify, organize, and elaborate on what they've learned sufficiently so that they can explain it to others. Furthermore, when they encounter conflicting ideas coming from peers, they may reexamine their own perspectives and possibly revise their views. And active discussions of academic content provide a means through which learners can observe and acquire more advanced ways of thinking and more sophisticated views of the nature of knowledge. One instructional strategy gaining research support is creating a *community of learners*—a classroom in which teachers and students collaborate to build a body of knowledge about a topic and help one another learn about it. In such a context, face-to-face and online interactions and feedback are common, as are collective efforts at meaning-making.

9.3 Explain how learners' cultural backgrounds can influence their interpretations of new information and experiences; also explain how novice learners can effectively participate in one or more communities of practice. Any longstanding social group has a *culture*, which includes behaviors and beliefs that older, more experienced group members pass along to newer members. A learner's culture influences the ways in which they think about and interpret virtually any new situation. From day-to-day experiences and interactions within the culture, the learner acquires general schemas and scripts regarding what things are typically like and how common activities typically unfold. In addition, a culture passes along certain *worldviews*—all-encompassing sets of beliefs and assumptions about the very nature of reality and human existence. Occasionally, students from certain cultural backgrounds may not have the schemas and scripts they need to effectively make sense of what they are learning at school; at other times, students may hold certain worldviews that are inconsistent with scientific theories or that bias their understandings of historical events. Cultures typically include *communities of practice*—groups of people who share common interests and goals (e.g., making sick people well, creating works of art) and regularly interact and coordinate their efforts in pursuit of those interests and goals. In general, people best gain competence in a community of learners by actively participating in it, usually at the fringe of an activity at first, and then gradually becoming more centrally involved as competence increases.

9.4 Describe key elements of society that impact learning and explain how authentic activities can enhance learners' performance in their out-of-school lives. A *society* is a very large, enduring social group that has fairly explicit social and economic structures, as well as collective institutions and activities. Any society influences learning in a number of ways—for instance, through the resources it provides, the activities it supports, and the general messages it communicates. Furthermore, different members of society have different areas of expertise, and so its members must rely on one another for their individual and collective success. One critical way of preparing students for their eventual participation in adult society is engaging them in *authentic activities*—those that resemble tasks in the outside world. For example, authentic activities may involve solving complex, real-world problems or engaging in community service. Such activities foster meaningful learning and increase the odds that students will eventually apply what they've learned to future tasks and problems outside of school.

9.5 **Describe the unique roles that digital technologies and the internet can play in classroom instruction.** Recent advancements in digital technologies offer many benefits for instructional practice. They enable seamless integration of multiple media and pedagogical strategies into instruction, which can be simultaneously delivered to students in distant locations and individualized for different students' unique abilities and needs. Appropriately designed and scaffolded software can provide mechanisms through which students can manipulate complex data sets and bodies of information without being overwhelmed by the cognitive load. The internet puts information about many topics within easy reach—for instance, through *online learning* programs—and allows teachers and students to communicate and collaborate easily and frequently. And some technology-based instructional programs simulate real-world or fantasy environments that engage students in highly motivating learning and problem-solving tasks. To be effective as instructional tools, however, digital technologies require students to have some degree of *technological literacy* regarding how to use various hardware and software tools and how to conduct productive internet searches. Teachers play important roles in helping students to succeed in online learning contexts.

Practice for Your Licensure Exam

A Project on Immigration

Ms. Jackson has just completed a social studies unit on immigration with her fifth-grade students. Rather than giving her students a test at the end of the unit, she decides to have the class work on a project instead. She wants to be sure that all of the students in the class have an opportunity to contribute to the project, and she wants the project to be meaningful to the students—she really wants it to be an authentic activity. She also is keenly aware that students in her class come from several different neighborhoods, and that their cultural backgrounds and experiences have not all been the same.

1. **Constructed-response question:**

   What steps should Ms. Jackson take to come up with a class project that will be perceived as authentic, but that also will be meaningful to the diverse students in her class? What would be an example of an appropriate topic for the class project?

2. **Multiple-choice question:**

   By having the students work on a class project, Ms. Jackson…
   a. is ensuring that the students will use technology to gather information.
   b. is attempting to create a community of learners.
   c. is trying to get all of her students to adopt the same worldviews on immigration.
   d. has created a learning context in which her students' divergent backgrounds and experiences won't really matter, since they are all working toward one common goal.

3. **Multiple-choice question:**

   Ms. Jackson has the students work in small groups, with each group being responsible for developing expertise about a particular aspect of immigration. The groups then consult with each other as needed, to benefit from each group's area of expertise. This is an example of
   a. legitimate peripheral participation.
   b. a schema.
   c. service learning.
   d. distributed knowledge.

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 10

Motivation: Confidence, Values, and Needs

Ariel Skelley/DigitalVision/Getty Images

Learning Objectives

10.1 Describe the nature of academic motivation.

10.2 Describe three major categories of motivational beliefs.

10.3 Use a social cognitive perspective to explain how students' beliefs about their abilities in various areas develop.

10.4 Compare and contrast perspectives on learning associated with behaviorism, cognitive psychology, contextual theories, and social cognitive theory.

10.5 Describe the beliefs that students develop about what they find interesting and valuable.

10.6 Describe ways in which working on various academic tasks meets students' needs.

CASE STUDY

Two Students, Same Problem

Cody is in the fourth grade. He likes all of his academic subjects, but he really does not enjoy his physical education class. The class has been learning how to play basketball for the past few weeks. The students get a lot of free time to shoot hoops. Cody is rarely able to get the ball into the basket. His classmates start to tease him a bit and laugh at him. When the class is ready to play on teams, it seems that nobody wants Cody to be on their team. Cody's confidence in his ability to learn how to play basketball is now very poor, and he does not see any way to improve. He pretends to be sick a few times so that he can stay home on basketball days. He is quite sad, because he feels like the kids in his class will not want to play with him.

Carrie is also a fourth grader. She has been having a difficult time solving math problems this year. She practices a lot, but she keeps making mistakes. Carrie is beginning to doubt her ability to learn math problem-solving skills, and she starts to daydream more and more in class. She used to think math was fun, but these days, she does not enjoy math at all. Her parents offer to get a tutor to help her, but she now feels like she just can't learn math. They even offer her a reward of $5.00 if she gets 80% of the questions right on her next math quiz. She tells her mom, "What's the use? I can't do this stuff, it's a waste of time and money."

What do Cody and Carrie have in common? Several similarities should be apparent to you:

- They both lack confidence for performing a specific task (getting the ball in the hoop for Cody and solving math problems for Carrie).
- As time goes by, they become less confident.
- They both become frustrated and somewhat resigned to their situations.
- Neither of them enjoy the school subjects in which they are experiencing difficulties.

Both Cody and Carrie experience debilitating beliefs about their lack of ability in specific areas. This lack of confidence is probably related to their lack of enjoyment of physical education (in Cody's case) and math (in Carrie's case). Our students' confidence in their abilities to learn is very powerful. When students feel confident, they are willing to engage with complex problems and assignments; but when they feel frustrated (like Cody and Carrie do), they are more likely to just give up than to try harder. Students' enjoyment of learning about topics is also powerful. When students enjoy what they are learning and find the content useful and interesting, they're more likely to want to continue to explore that content in the future.

As you can tell, Cody and Carrie are experiencing difficulties with learning, but they also are experiencing motivational problems. In this chapter, we are going to examine student motivation. We'll start with **Social Cognitive Theory**, a perspective that can help us understand both learning and motivation; this theory focuses on how our students learn by observing others, how they develop a sense of confidence in their abilities in specific activities, and how, in the process, they begin to take control of their own behavior. We'll then explore theories that focus specifically on motivation. First, we will look at Expectancy-Value Theory, which focuses on our students' beliefs about their abilities, as well as their valuing of what they are learning in school. Then we'll examine Self-Determination Theory, which focuses on the ways in which various learning tasks meet (or don't meet) some of our students' needs.

The Nature of Motivation

Learning Objective 10.1 **Describe the nature of academic motivation.**

In the first part of this chapter, we're going to look at some of the different ways researchers think about motivation. Motivation is a term that is often used very broadly. In general, **motivation** is something that energizes, directs, and sustains behavior; it gets people moving, points them in a particular direction, and keeps them going. More specifically, motivation has several effects:

- It directs behavior toward particular goals.
- It leads to increased effort and energy in pursuit of those goals.
- It increases initiation of and persistence in certain activities, even in the face of occasional obstacles and interruptions.
- It affects cognitive processes, such as what learners pay attention to and how much they think about and elaborate on academic content.

We often see students' motivation reflected in their *personal investment* and their cognitive, emotional, and behavioral *engagement* in certain activities. In general, then, motivation increases students' physical and cognitive **time on task**, an important factor affecting their learning and achievement in a particular domain (Fredricks et al., 2004; Ladd & Dinella, 2009; Lavrijsen et al., 2022; Lee & Shute, 2010; Maehr & McInerney, 2004). Let's first consider the many questions that teachers might ask when trying to understand a student's lack of motivation.

Experiencing Firsthand

Why Are Some Students Not Motivated?

Jodie is 14 years old, and her science teacher, Mr. Walters, feels that she is not motivated.

Mr. Walters approaches you, as one of his teacher colleagues, and asks you to try to figure out why Jodie is not motivated. What questions would you ask Jodie to try to understand her lack of motivation? What ideas do you have for Mr. Walters to try to improve the situation? Keep your list of questions, because we will return to them later in the chapter.

As you probably realized from thinking about Jodie's situation, teachers have many options to consider when thinking about how to best motivate their students. Researchers have approached the study of motivation from several theoretical frameworks, which we will examine in this chapter. Each of these theoretical perspectives provides pieces of the motivation "puzzle," offering useful ideas about how we can motivate students in classroom settings, and so we'll draw from all of them in the pages ahead.

Three general principles of motivation underlie much of our discussion:

- *All children and adolescents are motivated in one way or another.* Occasionally we hear educators, policy makers, or the public at large talking about "unmotivated" students. In reality, all students are motivated to engage in some activities. One student may be keenly interested in classroom topics and seek out challenging coursework, participate actively in class discussions, and earn high marks on projects. Another student may be more concerned with the social side of school, interacting frequently with classmates, participating in many extracurricular activities, and running for an office in student government. Still another may be focused on athletics, excelling in physical education classes, and playing or watching sports most afternoons and weekends. Yet another student—perhaps because of an undetected learning disability, shy temperament, or seemingly uncoordinated body—may be motivated to *avoid* academics, social situations, or athletic activities.
- *Motivation to do well in school is grounded in a variety of cognitive and sociocultural factors that evolve over time.* A common misconception is that students can turn their motivation "on" or "off" at will, much as one would flip a light switch. In fact, students' motivation to achieve—or *not* achieve—in a traditional academic curriculum is the result of many factors that don't easily change overnight. Some of

these factors are cognitive in nature, such as students' short-term and long-term goals and their self-efficacy for learning academic topics. Others have social or cultural origins, such as the activities and values that students' families and local communities endorse.

- *Conditions in the classroom and school play a major role in students' motivation to learn and achieve.* Motivation isn't necessarily something that learners bring *to* school; it can also arise from environmental conditions *at* school. As you'll see throughout the chapter, we teachers can do many things to support students' motivation to learn and achieve in ways that promote their long-term success and productivity. Even the seemingly "little" things we do—for instance, communicating genuine concern about students' academic and personal well-being and ensuring that their peers treat them respectfully—can have a significant long-term impact (Yeager & Walton, 2011).

There are many different ways to think about motivation. As teachers, we need to understand that students' motivation is not simple and that there is a range of different influences that impact our students. In the following sections, we are going to introduce some key perspectives, and discuss ways teachers can shape positive motivational beliefs for their students. But first, we're going to examine an idea that recurs throughout all of the various theories of motivation: the difference between intrinsic and extrinsic motivation.

Intrinsic and Extrinsic Motivation

A student who has **intrinsic motivation** engages in an activity because it is enjoyable and interesting; that is, the motivation is internal to the activity itself. In contrast, a student who has **extrinsic motivation** engages in an activity to receive a reward (like a good grade) or to avoid a punishment that comes from outside (external to) the activity itself.

Consider these two students in an advanced high school writing class:

- Sheryl is taking the class for only one reason: Earning an A or a B in the class will help her earn a scholarship at State University, which she desperately wants to attend.
- Shannon has always liked to write. Doing well in the class will certainly help her get a scholarship at State University, but more importantly, she wants to become a better writer and knows that the skills she can gain will be useful in her future profession as a journalist. An additional bonus is that she's learning many new techniques for making her writing more vivid and engaging.

Sheryl has extrinsic motivation: She's motivated by factors external to herself and unrelated to the task at hand. Extrinsically motivated learners perform a task as a means to an end—perhaps the good grades, money, or recognition that particular activities and accomplishments bring—rather than as an end in itself. In contrast, Shannon shows intrinsic motivation: She's motivated by factors within herself and inherent in the task she's performing. Intrinsically motivated learners may engage in an activity because it gives them pleasure and a sense of fulfillment. Some learners with high levels of intrinsic motivation become so focused on and absorbed in an activity that they lose track of time and completely ignore other tasks—a phenomenon known as **flow** (Csikszentmihalyi, 1996; Csikszentmihalyi et al., 2005; Miyamoto et al., 2020; Shernoff & Csikszentmihalyi, 2009).

Learners are likely to experience benefits when they're *intrinsically* motivated to engage in classroom activities. Intrinsically motivated learners willingly tackle assigned tasks and are eager to learn material, are more likely to process information in effective ways (e.g., by engaging in meaningful learning), and are more likely to achieve at high levels. In contrast, extrinsically motivated learners may have to be enticed or prodded, may process information only superficially, and may be interested in performing only easy tasks and meeting minimal requirements (Becker et al., 2010; Reeve, 2006; Schiefele, 1991; Taylor et al., 2014).

In the early grades, most students are eager and excited to learn new things at school. But at some point between grades 3 and 9, their intrinsic motivation to master school subject matter typically declines (Gottfried et al., 2001; Lepper et al., 2005; Otis et al., 2005). This decline is probably the result of several factors. As students get older, they're increasingly reminded of the importance of good grades (extrinsic motivators) for promotion, graduation, and college admission, causing them to focus their efforts on earning high grade point averages. In addition, they become more cognitively capable of setting and striving for long-term goals, and they begin to evaluate school subjects in terms of their usefulness in meeting such goals. (Imagine a high school student who is studying chemistry, but mostly because she wants to become a doctor—her motivation to study chemistry here is clearly extrinsic.) Moreover, students may grow increasingly impatient with the overly structured, repetitive, and boring activities they often encounter at school (Battistich et al., 1995; Garon-Carrier et al., 2016; Larson, 2000; Shernoff et al., 2003).

Many new teachers think about intrinsic and extrinsic motivation as opposite ends of a continuum, but this is absolutely not the case! Often learners are simultaneously motivated by *both* intrinsic and extrinsic factors (Cameron & Pierce, 1994; Covington, 2000; Lepper et al., 2005). For example, although Shannon enjoys her writing course, she also knows that getting a good grade will help her get a scholarship at State U., and good grades and other external rewards for high achievement may confirm for her that she's mastering subject matter (Hynd, 2003). Furthermore, in some situations, extrinsic motivation—perhaps in the form of extrinsic reinforcers for academic achievement or desired behavior—may be the only thing that can get students on the road to successful learning and productive behavior. Yet, ultimately, motivation from *within* is what will sustain students over the long run.

Let's look at Figure 10.1. The columns represent low and high extrinsic motivation, and the rows represent low and high intrinsic motivation. Which of these four students do you think would be the most challenging to have in class? Most would probably agree that Steve would be rather difficult to teach. Steve is the type of student who has no intrinsic motivation and is not motivated by extrinsic incentives. Steve is basically a student who has given up; students like Steve are particularly likely to be at risk for many future academic difficulties (Corpus et al., 2016). John doesn't like math, but he is still motivated by extrinsic rewards, whereas Ada does like math, but really doesn't care about any incentives. Janet is quite typical of high achieving students—she likes math, but also is motivated by grades. Many students who are focused on getting into college may have profiles similar to Janet's.

See Chapter 6 if you need a refresher on the distinction between extrinsic and intrinsic reinforcers.

Students can be both intrinsically and extrinsically motivated at the same time.

Figure 10.1 Intrinsic and extrinsic motivation are two distinct types of motivation, not opposite ends of a continuum.

		Extrinsic Motivation	
		Low	High
Intrinsic Motivation	Low	Steve does not like math, and incentives don't make him like it any more (he doesn't care if he gets a good grade).	John does not like math, but he is motivated in math class because he wants to get an "A" so he can get into a good college.
	High	Ada likes math and finds it very interesting, but she really doesn't care about the grades that she gets in math class.	Janet likes math and finds it interesting, but she also cares about her grades and wants to get an "A" so she can get into a good college.

Extrinsic reinforcers appear to have no adverse effects when they're unexpected—for example, when students get special recognition for a community service project—or when the reinforcers aren't contingent on specific behaviors—for example, when they're used simply to make an activity more enjoyable. They can even be beneficial if used to encourage students not only to do something but also to do it *well*. When rewards convey information to students about why they have done well or have made considerable improvement (e.g., rewarding a student for using an appropriate strategy), they can enhance students' self-efficacy (more on this later in the chapter) and focus students' attention on mastering the subject matter (Cameron, 2001; Deci & Moller, 2005; Reeve, 2006).

Sometimes students may initially find a new topic or skill boring or frustrating and thus may need external encouragement to continue (Cameron, 2001; Deci et al., 2001; Hidi & Harackiewicz, 2000). On such occasions, one effective strategy is to praise students in a manner that communicates information but doesn't show intent to control behavior (Deci, 1992; Ryan et al., 1983). For example:

- "Your description of the main character in your short story is so detailed and vivid! It really makes her come alive."
- "Your poster clearly describes every step you took in your experiment. Your use of a bar graph makes your results easy to see and interpret."

Another strategy is to teach students to reinforce *themselves* for their accomplishments, a practice that clearly keeps control in their hands.

Ideally, we should rely on intrinsic reinforcers—such as students' own feelings of pride and satisfaction about their accomplishments—as often as possible. One problem with *ex*trinsic reinforcers (e.g., praise, good grades) is that they can undermine intrinsic motivation, especially if students perceive them as controlling their behavior and limiting choices (Deci & Moller, 2005; Lepper & Hodell, 1989; Reeve, 2006). Extrinsic reinforcers may also communicate the message that classroom tasks are unpleasant chores—why else would a reinforcer be necessary? (Hennessey, 1995; Stipek, 1993). When students start to expect extrinsic reinforcers for doing things that they already like to do, they may actually do those things less! Despite a great deal of research showing that providing extrinsic reinforcers can often harm intrinsic motivation, many people are very reluctant to believe that extrinsic reinforcers can be problematic (Murayama et al., 2016). The most important principle in this regard is to use reinforcers judiciously and with awareness of the guidelines provided here.

Framing Motivation Around Questions Students Ask Themselves

Learning Objective 10.2 **Describe three major categories of motivational beliefs.**

As you have already seen, student motivation is multifaceted. One way to think about student motivation is to consider the questions that students might ask themselves before they are engage in academic tasks, while they are doing academic tasks, and after they have competed academic tasks. Sometimes students explicitly think about these questions, but more often their thoughts about these questions become internalized and may be resistant to change. In this chapter, we will consider three questions that students ask themselves.

- *Can I do this?* When students are doing their schoolwork, they often have opinions about whether they believe that they can successfully complete a given task. Some tasks may be perceived as easy to complete. But what about when a task is perceived as challenging? Some students approach challenging tasks with enthusiasm, seeing these challenges as opportunities to learn. But other students, when presented with a challenging task, may appear to be completely unmotivated; if students do not believe that they can engage with a task successfully, they may participate half-heartedly or just give up entirely.

- *Would I want to do this?* In education, students often are taught material that they don't see any purpose in learning. As a teacher you may know why you are teaching a particular topic and why it is important for your students, but your students may not see any value in the task. As we will discuss, there are actually many different reasons why a student might want to do a particular task. As teachers, we can help our students to see the relevance of various topics.
- *If I do this, will it meet my needs?* As humans, we have many different needs. Some of these are very basic, biological needs (e.g., such as the need to eat and drink), whereas others are more psychological in nature. When engagement in various academic tasks meet some of these needs, students will be more likely to engage with the task.

In each of the following sections, we use these questions to frame our discussion of the various facets of academic motivation. If we truly want to "motivate" our students, then as teachers we need to understand that motivation involves several different beliefs that students hold. Moreover, as you will see throughout this and the next chapter, these beliefs are not permanent—students' motivational beliefs can and do change over time, and we as teachers can support the development of adaptive beliefs in all of our students.

Can I Do This?

Learning Objective 10.3 **Use a social cognitive perspective to explain how students' beliefs about their abilities in various areas develop.**

Social cognitive theory, which was greatly influenced by the work of Albert Bandura (Bandura, 1977, 1986, 1997), both focuses on how students learn (which we have been examining in chapters 6 through 9), and provides a framework for beginning to understand student motivation. Let's first examine some basic assumptions of social cognitive theory:

- *People can learn and be motivated by observing others.* From the perspective of behaviorism, learning is often a process of trial and error: Learners try many different responses, keep those that bring desired consequences, and leave unproductive ones behind. Social cognitive theorists argue that learners don't necessarily have to experiment in such a trial-and-error manner. Instead, learners acquire many new responses simply by observing the behaviors of other individuals, or *models.* For example, a student might learn how to solve a long division problem or mouth off at a teacher simply by watching someone else do these things first. And by observing others engaging in various tasks, a learner's motivation to engage in those tasks might be affected.
- *Learning is an internal process that may or may not lead to a behavior change.* Rather than defining learning as a change in behavior (as many behaviorists do), social cognitive theorists (like cognitive psychologists) view learning as a mental change that may or may not be reflected in the learner's present or future motivated behaviors. For example, you might be motivated to dribble a basketball as soon as you watch someone else do it. And you might *never* be motivated to walk through campus nude, no matter how many times you see someone else do it.

Children learn many new behaviors simply by watching adults or peers perform them successfully. These observations can also at times affect their motivation to engage in those behaviors.

Clay
soft
squishy
cold
wet
dry
crumbly

Pearson Learning Group

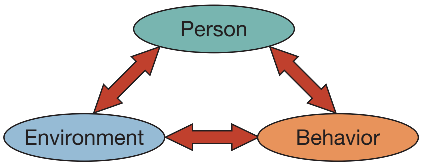


Figure 10.2 In social cognitive theory, environmental, behavioral, and personal variables mutually influence one another.

- *Cognitive processes influence motivation as well as learning.* Social cognitive theorists recognize the importance of cognitive processes (e.g., attention, encoding) for learning new information, but they point out that cognition is also an important ingredient in *motivation*. For example, people set mental *goals* toward which they direct their behavior, and their goals are based to some degree on their *expectations* about what they might reasonably accomplish. People's beliefs about their own ability to execute certain behaviors or reach certain goals—their *self-efficacy*—influence how hard they try, how long they persist at challenging tasks, and ultimately how much they learn and achieve. In the opening case studies, Cody had low self-efficacy for playing basketball, and Carrie had low self-efficacy for solving math problems.
- *People and their environments mutually influence each other.* Unlike behaviorists, who focus primarily on how environmental variables influence learning, social cognitive theorists acknowledge that learners influence their environments, often quite deliberately. To some degree, learners influence their environments through their *behaviors*. For example, the responses they make (e.g., the classes they choose to take) affect the learning opportunities they have and the consequences they experience. Mental processes, personality characteristics, and other things that learners "own" in some way—called *person* variables by social cognitive theorists—come into play as well. Ultimately, all three of these factors—behavior, person, and environment, influence one another, as shown in Figure 10.2. Social cognitive theorists use the term **reciprocal causation** when referring to this constant interplay among behavior, person, and environment variables (e.g., Bandura, 1989, 2008).

Table 10.1 summarizes the assumptions just listed and offers examples of their implications for classroom practice.

Motivated Behaviors and Skills That Can Be Learned Through Modeling

Babies have some ability to imitate others beginning early in infancy (Jones, 2007; Meltzoff, 2005; Nielsen & Tomaselli, 2010). Certain neurons in the brain, called **mirror neurons**, become active either (1) when learners observe others engaging in a particular behavior or (2) when learners engage in that same behavior themselves. It appears, then, that our brains are prewired to make connections between observing and doing, thus

PRINCIPLES/ASSUMPTIONS

Table 10.1 Basic Assumptions of Social Cognitive Theory and Their Educational Implications

Assumption	Educational Implication	Example
Learning by observation	Help students acquire new behaviors more quickly by demonstrating those behaviors yourself.	Demonstrate appropriate ways to resolve interpersonal conflicts. Then ask students to role-play conflict resolution in small groups, and compliment those who use prosocial strategies.
Learning is an internal process that may or may not be reflected in behavior	Remember that new learning doesn't always reveal itself immediately but may instead be reflected in students' behaviors at a later time.	When one student engages in disruptive behavior, take appropriate steps to discourage it; otherwise, classmates who have witnessed the misbehavior may be similarly disruptive in the future.
Cognitive processes in motivation	Encourage students to set short-term goals for themselves, especially goals that are challenging yet achievable.	When teaching American Sign Language to help students communicate with a classmate who has hearing loss, ask them to set goals for how many new words and phrases they can learn each week.
Reciprocal influences among environmental, behavioral, and personal variables	Encourage students to consider contextual (environmental), behavioral, and personal variables so that they learn effectively.	Describe the benefits of doing homework at the library instead of at a friend's house. If students know that they study more effectively in quiet settings, they may benefit from this strategy.

enhancing our ability to learn new skills from our surroundings (Arbib, 2005; Gallese et al., 2011; Hunter et al., 2013).

In general, a **model** can take one of three forms (Bandura, 1977, 1986). One form, of course, is a *live model*—an actual person demonstrating a particular behavior. But we can also learn from a *symbolic model*—a person or character portrayed in a book, film, television show, video game, or other medium. For example, many children model their behavior after athletes, musicians, or such fictional characters as Harry Potter and Katniss Everdeen. Youth today often are exposed to models more frequently than in the past; many of your students spend a lot of time using TikTok and other forms of social media, which are available anywhere and anytime via tablets, smartphones, and smart watches. Finally, we can learn from *verbal instructions*—descriptions of how to successfully execute certain behaviors—without another human being, either live or symbolic, being anywhere in sight. Social cognitive theorists sometimes use the term **modeling** to describe what a model does (i.e., demonstrate a behavior) and at other times to describe what the observer does (i.e., imitate the behavior). To minimize confusion, we'll often use the verb *imitate* rather than *model* when referring to what the observer does.

Children and adolescents may not be motivated to engage in behaviors that are novel to them. For example, a child might be fearful of jumping into the deep end of a swimming pool, but after observing one of their friends jump in safely, the child might feel more confident, and attempt to jump. By observing what other people do, learners can acquire a wide variety of psychomotor skills, from relatively simple actions (e.g., brushing hair) to far more complex ones (e.g., performing dance moves or gymnastics routines) (Boyer et al., 2009; Vintere et al., 2004). But observations of other people also enable learners to acquire many behaviors with cognitive or emotional components. For example, learners are apt to do the following:

- Develop more sophisticated drawing skills when others demonstrate such skills, either in person or on video (Geiger et al., 2010)
- Learn to fear particular stimuli or situations if others show fear in those circumstances (Mineka & Zinbarg, 2006)
- Better resist the enticements of a stranger when a peer has modeled resistance strategies (Poche et al., 1988)
- Be less likely to tolerate racist statements if people around them refuse to tolerate such statements (Blanchard et al., 1991)

Research has been conducted concerning the impact of models in three areas: academic skills, aggression, and productive interpersonal behaviors.

Academic Skills Learners acquire many academic skills, at least in part, by observing what others do. For instance, they may learn how to calculate percentages or write a cohesive composition partly by observing how adults or peers do these things (Braaksma et al., 2002; Harris et al., 2009; Schunk & Hanson, 1985). Modeling of academic skills can be especially effective when the model demonstrates not only how to *do* a task but also how to *think about* the task, which is known as **cognitive modeling** (Schunk, 1998; Zimmerman, 2004). As an example, consider how a teacher might model the thinking processes involved in a long division problem:

> First I have to decide what number to divide 4 into. I take 276, start on the left and move toward the right until I have a number the same as or larger than 4. Is 2 larger than 4? No. Is 27 larger than 4? Yes. So my first division will be 4 into 27. Now I need to multiply 4 by a number that will give an answer the same as or slightly smaller than 27. How about 5? 5 × 4 = 20. No, too small. Let's try 6 × 4 = 24. Maybe. Let's try 7 × 4 = 28. No, too large. So 6 is correct.[1]

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[1] Extract from "Teaching Elementary Students to Self-Regulate Practice of Mathematical Skills with Modeling," by Dale H. Schunk, from *Self-Regulated Learning: From Teaching to Self-Reflective Practice*, edited by Dale H. Schunk and Barry J. Zimmerman, p. 146. Copyright © 1998 by Guilford Publications, Inc.

Academic skills also can be enhanced when students view models who work hard and don't give up when they encounter difficult problems or tasks (Lin-Siegler et al., 2016). For example, videos that demonstrate how scientists persevere with solving complex problems by consulting with their colleagues or by adopting different strategies may enhance students' beliefs in their own abilities to persevere with difficult problems.

Aggression Numerous studies have indicated that children become more aggressive when they observe aggressive or violent models (Bandura, 1965; Ebesutani et al., 2014; Guerra et al., 2003). Children learn aggression not only from live models but also from the symbolic models they see in films, on social media, and in video games—and possibly also from aggressive lyrics they hear in music (Anderson et al., 2003; Carnagey et al., 2007; Friedlander et al., 2013). Furthermore, young learners' aggressive behaviors tend to take the same *forms* as the aggression they witness. Boys in particular are apt to copy other people's aggressive actions (Bandura et al., 1963; Bushman & Anderson, 2001; Lowry et al., 1995).

A classic study by Bandura, Ross, and Ross (1961) illustrated the power of modeling for both encouraging and discouraging aggressive behavior. Preschoolers who observed an adult play aggressively with an inflatable doll mimicked those behaviors when they played with the same toy. In contrast, children who observed a nonaggressive adult were even less aggressive than a control group who had no adult model. With regard to aggression, then, models can have an impact either way: Aggressive models lead to increased aggression in children, and nonaggressive models lead to decreased aggression.

Productive Interpersonal Behaviors Learners acquire many interpersonal skills by observing and imitating others. For example, when they talk about literature in small groups, children may adopt one another's strategies for conducting discussions, perhaps learning how to solicit one another's opinions ("What do you think, Jalisha?"), express agreement or disagreement ("I agree with Kordell because . . .") and justify a point of view ("I think it shouldn't be allowed, because . . .") (Anderson et al., 2001, pp. 14, 16, 25). And children with mild or moderate forms of an autism spectrum disorder are apt to play more effectively with their peers after watching a video of a peer using appropriate social skills in play activities (Nikopoulos & Keenan, 2004).

In Chapter 13, we discuss *reciprocal teaching*, which is a good example of how students can acquire new skills through social interactions.

Learners can also acquire prosocial behaviors in part through observation and modeling (Elliott & Vasta, 1970; Jordan, 2003). In one study (Rushton, 1980), children observed an adult playing a game and reinforcing himself with tokens for good performance. Some children saw the adult donate half of his earned tokens to a poor boy named Bobby pictured on a poster in the room; other children observed the adult keep all his winnings for himself. After that, the children played the game and could reward themselves with tokens. The more tokens they earned, the better the prize they could purchase. They could make a donation to Bobby but doing so meant less purchasing power for themselves. Children who had seen a generous model were more likely to give some tokens to Bobby than were children who had seen a selfish model—not only at that time but also in a follow-up session two months later.

Regularly expose students to prosocial models in all subject areas.

You can learn more about the development of prosocial behaviors in Chapter 3.

Benevolent models in popular media can have a positive impact as well. Rather than encouraging aggression, some characters in books, television programs, and other popular media promote prosocial behaviors—those aimed at helping others rather than at enhancing personal well-being—and such models can prompt children and adolescents to behave similarly (Anderson, 2003; Gladding & Villalba, 2014; Jordan, 2003; Nucci, 2001; Prot et al., 2014; Rushton, 1980).

Characteristics of Effective Models

Learners don't always imitate the people they see. Influential models (i.e., models whom learners are more likely to imitate) typically have several characteristics (Bandura, 1986; Rosenthal & Bandura, 1978; Schunk, 1987). First, they're *competent* at the behavior or skill in question. Learners usually want to behave like people who do something well rather than poorly. For instance, children may try to imitate the basketball skills of a professional basketball player rather than a peer on their own team. Even preschoolers have some ability to discriminate between competent and incompetent models, and tend to prefer the more competent ones (Harris & Want, 2005; Hermes et al., 2015).

Second, influential models typically have *prestige and power.* Some effective models—a world leader, a renowned athlete, a popular music star—are famous at a national or international level. The prestige and power of other models—the drum major in the marching band, the president of student council, a gang leader—may be more localized. As an example of such local influence, children are more likely to interact with students who have disabilities when they see popular classmates (rather than unpopular ones) initiating such interactions (Sasso & Rude, 1987).

Third, and perhaps most important, influential models exhibit *behaviors relevant to learners' own circumstances.* Learners are most likely to adopt behaviors they believe will be useful and that they believe that they can undertake successfully (Braaksma et al., 2002; Schunk & Hanson, 1985). Learners often are more likely to imitate behaviors that they see as appropriate for their gender, with different individuals having varying views about which activities are "gender appropriate" (Grace et al., 2008; Leaper & Friedman, 2007).

As teachers, we're likely to be perceived by most students as competent and somewhat powerful—that is, we're likely to be influential models. Thus, we "teach" not only by what we say but also by what we do. It's critical, then, that we model appropriate behaviors—for instance, showing enthusiasm for what we are teaching and fairness in our dealings with all students; and it's also critical that we *don't* model inappropriate ones (e.g., Bryan, 1975).

Yet our students won't always perceive our behaviors as being relevant to their own circumstances. For instance, students from cultures and socioeconomic groups very different from our own may think that certain content has little value in their own lives. Students of both genders may view certain subjects and careers as being only for males or only for females. And students with disabilities may believe they're incapable of performing the skills that a nondisabled teacher demonstrates. Ideally, students need to see successful models who are similar to themselves in obvious ways—for instance, in race, cultural background, socioeconomic status, gender, and (if applicable) disability (Martin & Ruble, 2004; Pang, 1995; Powers et al., 1995).

Expose students to successful male and female models from diverse cultural and socioeconomic backgrounds. Also, expose them to models who have achieved success despite disabilities. Use technology (e.g., Zoom) to bring these individuals into your classroom virtually to interact with your students.

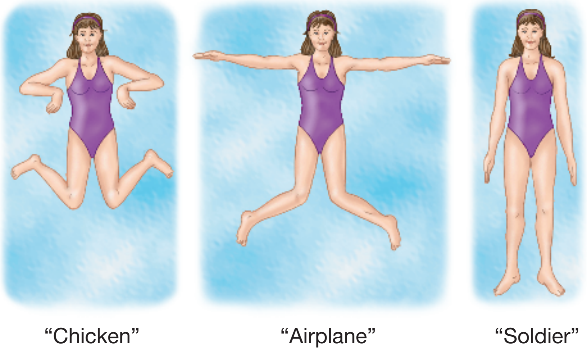
Essential Conditions for Successful Modeling

Even with the presence of influential models, however, learners don't always acquire the behaviors and skills they see others demonstrate. Four conditions are necessary for successful learning from models: attention, retention, motor reproduction, and motivation (e.g., Bandura, 1986).

Attention To learn effectively, *the learner must pay attention to the model* and, in particular, to critical aspects of the modeled behavior. For instance, students must observe carefully as we show proper procedures in the science lab or demonstrate the elementary backstroke, and they must listen attentively as we pronounce *Cómo está usted?* in a Spanish class.

Chapter 7 presents many strategies for enhancing students' attention and retention, and Chapter 12 presents strategies for managing the classroom environment so that students are able to pay attention.

Figure 10.3 Often learners can more easily remember a complex, multifaceted behavior—such as the sequence of arm movements in the elementary backstroke—when the various components have verbal labels.



Retention After paying attention, *the learner must remember what the model does.* Students are more likely to recall information they've encoded in memory in more than one way—perhaps as both a visual image and a verbal representation (Mayer, 2011a; Moreno, 2006). As teachers, then, we may often want to describe what we're doing as we demonstrate behaviors. We may also want to give descriptive labels to complex behaviors that might otherwise be hard to remember (Vintere et al., 2004; Ziegler, 1987). For example, in teaching swimming, an easy way to help students remember the sequence of arm positions in the elementary backstroke is to teach them the labels *chicken*, *airplane*, and *soldier* (see Figure 10.3).

Motor Reproduction In addition to attending and remembering, *the learner must be physically capable of reproducing the modeled behavior.* When a student lacks the ability to reproduce an observed behavior, motor reproduction obviously can't occur. For example, first graders who watch a teenager throw a softball don't have the muscular coordination to mimic the throw. And high school students who haven't yet learned to roll their *r*s will have trouble repeating the Spanish teacher's tongue twister: *Erre con erre cigarro, erre con erre barril. Rápido corren los carros del ferrocarril.*

It's often useful to have students imitate a desired behavior immediately after they see it modeled and to give them guidance and feedback that can help them improve their performance. This approach—sometimes known as *coaching*—is often more effective than modeling alone (Elliott & Busse, 1991; Kitsantas et al., 2000; Schunk & Swartz, 1993). Thus, a Spanish teacher could ask students to repeat the tongue twister right away, and acknowledge that it will feel and sound odd to make these sounds, but that their pronunciation will improve with practice. When considering this approach, however, we must keep in mind that some students may prefer to practice new behaviors in private at first and show us what they've learned only after they've achieved reasonable mastery (Castagno & Brayboy, 2008; Suina & Smolkin, 1994).

Motor reproduction also can be modeled via technology. For example, video demonstrations can be made available to students instantaneously through various websites such as YouTube. Some research suggests that students may be better able to reproduce behaviors that are modeled via technology when the video demonstration of the skill is filmed from the perspective of the person doing the task, as opposed to from the perspective of someone watching the task (Fiorella et al., 2017).

Motivation Finally, *the learner must be motivated to demonstrate the modeled behavior.* Some children may be eager to show what they've observed and remembered; for example, they may have seen the model reinforced for a certain behavior and thus have already been vicariously reinforced themselves. For example, imagine two brothers (Rick and Chad) who both have very messy bedrooms. One day Chad decides to spend the entire afternoon cleaning up his room. His parents are thrilled, and repeatedly praise Chad and give him some extra dessert that evening. Noticing that his brother received the praise and extra dessert, Rick spends the next afternoon immaculately cleaning his bedroom. Nevertheless, other children may not have any motivation to demonstrate something they've seen a model do, perhaps because they don't see the model's actions as being appropriate for themselves.

When all four factors—attention, retention, motor reproduction, and motivation—are present, modeling can be an extremely effective teaching technique. The Into the Classroom feature "Promoting Learning Through Modeling" offers several strategies that can maximize the effectiveness of modeling.

Into the Classroom

Promoting Learning Through Modeling

- **Make sure you have students' attention when modeling a desired behavior.**

  A middle school science teacher wants to show his class how to prepare a slide of swamp water for inspection under a microscope. He meets with students in groups of three or four so that everyone can closely observe what he does and he can make sure they are paying attention.

- **Describe what you are doing as you model a desired behavior.**

  As a fourth-grade teacher shows students how to use word processing software to edit their compositions, she explains every step she takes to insert new text, cut unwanted text, and use the thesaurus and spell-check functions. She also distributes a handout that describes, step by step, how to perform each of these procedures, and she shows them where to find important commands and functions on the screen.

- **When teaching a complex behavior or sequence or behaviors, provide descriptive labels that students can repeat to themselves to help them remember what they need to do.**

  To help students remember the new dance steps she demonstrates, a dance teacher instructs them to say such things as "One, two, gallop, gallop" and "One leg, other leg, turn, and turn" while performing the steps.

- **Have students perform a desired behavior immediately after you model it; give them guidance and feedback to help them improve their performance.**

  After an elementary art teacher shows students how to work effectively with watercolor paints, she gives them an opportunity to use the paints. While they are trying out the watercolors, she walks around the classroom, giving pointers on how to blend colors for desired shades and how to keep differently colored areas from bleeding into one another.

- **Show students how the skills you model can help them in their own lives.**

  After demonstrating how to use rounding to estimate sums, a middle school math teacher presents examples of how students might quickly estimate the total cost of several purchases at a local discount store.

- **Invite respected professionals to the classroom to demonstrate skills in their areas of expertise.**

  A high school journalism teacher invites a local newspaper reporter to show students how she determines the sequence in which she presents information in an article.

- **Show videos of skilled individuals performing complex psychomotor skills.**

  A gymnastics coach shows an aspiring young gymnast a video in which an expert performs a particular gymnastics skill. The coach also records a video of the child's execution of the skill. The coach and child then watch the two videos—sometimes pausing the videos at particular frames—to identify components of the skill in which the child could benefit from further practice.

- **Have students read about or observe positive role models in books, videos, and films.**

  In a unit on civic responsibility and community service, a high school social studies teacher has students read excerpts from Barack Obama's *Dreams from My Father*.

- **Introduce students to models who have successfully crossed traditional gender boundaries in certain professions.**

  When exploring various professions over the course of the school year, a second-grade teacher invites several adults in the community—including a female police officer and a male nurse—to come to class and describe what they do in their jobs.

- **Include competent children as well as adults in the role models you present.**

  Once a week, a kindergarten teacher invites one or two third graders to come and read storybooks to his class. The older children delight in their ability to show off their reading skills and work especially hard to make the stories lively and entertaining.

SOURCES: Boyer et al., 2009 (gymnastics example); Cohen, 1989; Elliott & Busse, 1991; Féry & Morizot, 2000; Gerst, 1971; Kitsantas et al., 2000; Mace et al., 1989; Obama, 2004; Rosenthal et al., 1972; Schunk, 1989c; Schunk & Hanson, 1985; Schunk & Swartz, 1993; Shute, 2008; Vintere et al., 2004, p. 309 (dance example); Ziegler, 1987.

Self-Efficacy

As we mentioned at the start of this chapter, researchers use social cognitive theory to understand aspects of both learning and motivation. The type of motivation that we described as the fourth condition for successful modeling is referred to as *self-efficacy*. In general, **self-efficacy** is a learner's self-constructed judgment about their ability to execute certain behaviors or reach certain goals. To get a sense of your own self-efficacy for various activities, try the following exercise.

Experiencing Firsthand

Self-Appraisal

Take a moment to answer the following questions:

1. Do you believe you'll be able to understand and apply educational psychology principles by reading this book and thinking carefully about its content? Or do you believe you're going to have trouble with the material regardless of how much you study?
2. Do you think you could learn to execute a reasonable swan dive from a high diving board if you were shown how to do it and given time to practice? Or do you doubt that you could learn, no matter how much training and practice were involved?
3. Do you think you could walk barefoot over hot coals unscathed? Or do you think the soles of your feet would be burned to a crisp?

Learners are more likely to engage in certain behaviors when they believe they'll be able to execute the behaviors successfully—that is, when they have high self-efficacy for the behaviors (e.g., Bandura, 1997). For example, we hope you have high self-efficacy for learning educational psychology, believing that with careful thought about what you read, you'll be able to understand and apply its key principles. You're probably quite skeptical that you could ever walk barefoot over hot coals, so we guess you have low self-efficacy regarding this endeavor. Obviously, then, self-efficacy plays a key role in learners' *outcome expectations* (i.e., predictions about the consequences that a particular behavior is likely to yield) for various courses of action.

Let's look at an example. There are many students who enjoy learning math during elementary school, and many of them begin high school with a desire to learn algebra (Greene, 2018). Nevertheless, algebra is quite different from much of the math that students learned previously. When students are successful in algebra, they often will continue to be excited about math; but many students experience difficulties learning algebra. The successful students' self-efficacy for math probably increases after the first algebra class, whereas the self-efficacy for math success quite likely decreases for the less successful students. Moreover, many students don't understand why algebra might be important in their future careers. Thus, for many students, there is a double-whammy—their self-efficacy goes down, and they also question the need to learn algebra in the first place; this creates a "perfect storm" for students to rule out careers that involve math skills.

See Chapter 3 for a discussion of other aspects of a learner's sense of self (e.g., self-concept, identity).

Self-efficacy is a component of one's overall sense of self. It may seem similar to such ideas as *self-concept* and *self-esteem,* but it's different from them in important ways (Bong & Skaalvik, 2003; Jansen et al., 2015; Marsh et al., 2012). When psychologists talk about self-concept and self-esteem (or self-worth), they're typically describing a fairly general self-view that pervades a broad range of activities (e.g., "Am I a good student?") and may encompass feelings as well as beliefs (e.g., "How proud am I of my performance?"). In contrast, self-efficacy is more task or situation specific and involves judgments (rather than feelings) almost exclusively (e.g., "Can I learn how to solve quadratic equations?").

Table 10.2 provides a comparison of several self-related concepts discussed in this chapter and in Chapter 3.

How Self-Efficacy Affects Motivation

Learners' sense of self-efficacy affects their choice of activities, their goals, and their effort and persistence. Ultimately, then, it also affects their learning and achievement (Bandura, 1982, 2000; Lee et al., 2014; Pajares, 2009; Schunk & Pajares, 2005; Zimmerman & Labuhn, 2012).

“SELF”-RELATED CONCEPTS

Table 10.2 Comparison of “Self”-Related Concepts

Term	Definition	Example
Self-efficacy	Belief that one is capable of executing certain behaviors or reaching certain goals. “Can I do this?”	When Lily’s math teacher demonstrates converting decimals to fractions, Lily feels confident that she can accurately complete a set of practice examples.
Self-esteem or self-worth	Judgments and feelings about being a worthy and valued individual. “How do I feel about myself?”	Although George is disappointed not to be selected for a competitive scholarship, he still feels that he is a good student who is valued by his teachers.
Self-concept	A multidimensional view of the self across a broad range of characteristics, including strengths and weaknesses. “What am I like?”	“I’m a pretty analytic person,” Antoinette muses, “math and physical sciences make a lot of sense to me, but I have to work harder at learning foreign languages.”
Self-regulation	Process of setting goals for oneself and engaging in behaviors and cognitive processes that lead to goal attainment. “What am I trying to achieve? What do I need to do?”	Sofia wants to run her first half-marathon. She creates a training schedule, planning to gradually increase her distances over time, and records her progress.
Self-regulated learning	Self-regulation specifically related to learning opportunities.	Elijah has set himself the goal of earning an A grade on his science project. He reads the grading rubric carefully and divides the project into several small steps to make sure he completes everything on time. When he has questions about his project, he makes an appointment to meet with his science teacher.

Choice of Activities Imagine yourself registering for classes, perusing the hundreds of courses in the semester schedule. You fill most of your schedule with required courses, but you have room for an elective. Only two courses are offered at the time slot you want to fill. Do you sign up for Advanced Philosophy of Mind, a challenging seminar taught by a world-renowned philosophy professor? Or do you sign up for an English literature course known across campus as being an “easy A”? Learners tend to choose tasks and activities at which they believe they can succeed and to avoid those at which they think they’ll fail. Eventually they also place greater *value* on activities in which they think they’ll do well (Bandura, 1986; Pajares, 2009).

Later in the chapter we’ll examine the development of value in greater detail.

Goals Learners set more ambitious goals for themselves when they have high self-efficacy in a particular domain. For example, adolescents’ choices of careers and occupational levels often reflect subject areas in which they have high rather than low self-efficacy (Bandura et al., 2001). An adolescent who has been successful in foreign language classes is more likely to pursue a career that might involve living in a non–English-speaking country than an adolescent who has experienced difficulty learning foreign languages.

Effort and Persistence Learners with a high sense of self-efficacy are more likely to exert effort when attempting a new task, and they’re more likely to persist when they confront obstacles. In contrast, learners with low self-efficacy for a task will put in little effort and give up quickly in the face of difficulty. For example, in the opening case study, Cody is convinced he can’t learn how to play basketball, and he actually feigns illness so that he doesn’t have to go to school on “basketball days.”

Learning and Achievement Learners with high self-efficacy tend to learn and achieve more than those with low self-efficacy, even when the two groups initially have similar ability levels (Bandura, 1986; Fast et al., 2010; Klassen, 2002; Williams & Williams, 2010). Learners with high self-efficacy may achieve at superior levels partly because they’re more likely to engage in cognitive processes that promote learning—paying attention, elaborating, organizing, and so on (Berger & Karabenick, 2010; Bong & Skaalvik, 2003; Liem et al., 2008; Schunk & Pajares, 2005).

Interpret reluctance and lack of persistence as possible indicators of low self-efficacy.

Some Overconfidence—But Not Too Much—Can Be Beneficial

Most 4- to 6-year-olds are quite confident about their ability to perform various tasks (Butler, 1990, 2005; Eccles et al., 1998). As they move through the elementary grades, however, they can better recall their past successes and failures, and they become increasingly aware of and concerned about how their performance compares with that of their peers. Presumably as a result of these changes, students gradually become less confident—although usually more realistic—about what they can and can't do (Butler, 2005; Dijkstra et al., 2008; Wigfield & Wagner, 2005).

Ideally, learners should have a reasonably accurate sense of what they can and cannot accomplish, putting them in a good position to capitalize on their strengths and address their weaknesses (Chen, 2003; Försterling & Morgenstern, 2002; Wang & Lin, 2005). However, a little overconfidence can be beneficial, because it may entice learners to take on challenging activities that will help them develop new skills and abilities (Assor & Connell, 1992; Bandura, 1997; Pajares, 2009). Within this context, it's useful to distinguish between *self-efficacy for learning* ("I can learn this if I put my mind to it") and *self-efficacy for performance* ("I already know how to do this") (Lodewyk & Winne, 2005; Schunk & Pajares, 2004). Self-efficacy for learning—for what one can *eventually* do with effort—should be on the optimistic side, whereas self-efficacy for performance should be more in line with current ability levels.

Sometimes students—especially girls—*under*estimate their chances of success, perhaps because they've had a few bad experiences or are especially attuned to how their own performance falls short relative to that of peers (Cole et al., 1999; Dijkstra et al., 2008; Schunk & Pajares, 2005). For example, a girl who gets a C in science from a teacher with exceptionally strict grading criteria may erroneously believe that she "just can't do" science. In such circumstances, students set unnecessarily low goals for themselves and give up easily in the face of small obstacles.

But it's also possible to have too much of a good thing. When learners are *too* overconfident, they can set themselves up for failure by forming unrealistically high expectations or exerting insufficient effort to succeed. Moreover, students will hardly be inclined to address weaknesses they don't realize they have (Bandura, 1997; Sinatra & Mason, 2008; Sticca et al., 2017; Sweeny et al., 2006; Zimmerman & Moylan, 2009).

Factors in the Development of Self-Efficacy

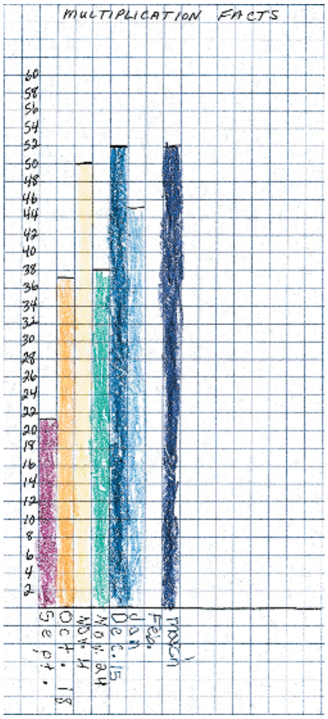
As teachers, one of our goals should be to help our students develop self-efficacy for learning about the content that we are teaching them (and for using that content outside of school settings). At least five factors affect learners' self-efficacy: their previous successes and failures, their current emotional state, other people's messages, other people's successes and failures, and successes and failures that they experience as members of a particular group (Bandura, 1986, 1997; Joët et al., 2011; Usher & Pajares, 2009).

Previous Successes and Failures The most important factor affecting learners' self-efficacy for an activity is the extent to which they've previously succeeded at that activity or similar ones (Bandura, 1986; Butz & Usher, 2015; Usher & Pajares, 2008; Williams & Williams, 2010). For example, Edward is more likely to believe he can learn to divide fractions if he has previously mastered fraction multiplication. However, learners show developmental differences in *how far back* they look when they consider their prior successes and failures. Perhaps because of more limited cognitive abilities, children in the early elementary grades typically recall only their most recent experiences when predicting the likelihood of future success. In contrast, older children and adolescents are apt to consider a long-term pattern of prior successes and failures (Eccles et al., 1998).

Adjust the initial difficulty of tasks to students' existing self-efficacy levels; then, gradually increase the challenge, providing structure to guide students' efforts.

As you can see, then, one important strategy for enhancing students' self-efficacy is to help them be successful at a variety of tasks in different content domains. Ideally, we should tailor task difficulty to students' current self-efficacy levels: Students with little or no confidence in their ability to perform in a particular domain may initially respond more favorably if we give them tasks at which they'll almost certainly do well. But ultimately, students develop higher self-efficacy when they can successfully accomplish more *challenging* tasks, perhaps initially with some degree of structure—that is, *scaffolding*—to increase the likelihood of successful performance (Falco, 2008; Lodewyk & Winne, 2005).

Figure 10.4 Nine-year-old Sophie has been charting her monthly progress in remembering multiplication facts. Although she has had minor setbacks, her general progress is upward. (She was absent for February's assessment.)



Nonetheless, mastery of important knowledge and skills, even fairly basic ones, often develops slowly over time. Consequently, it's often important to define success in terms of *improvement* rather than mastery (Butler, 1998a; Wang & Holcombe, 2010). In such instances we may need to provide concrete mechanisms that highlight day-to-day progress—for instance, giving students progress charts they can fill in themselves (e.g., see Figure 10.4), setting short-term goals that can reasonably be achieved, and providing frequent verbal or written feedback about the little things students are mastering.

Once students have developed a high sense of self-efficacy in a particular area, an occasional failure is unlikely to dampen their optimism very much. In fact, when these students encounter small setbacks, they know they *can* succeed if they try, and they also develop a realistic attitude about failure—that at worst it's a temporary setback and at best it can give them useful information about how to improve their performance (Bandura, 1989, 2008; Dweck, 2000).

Previous successes and failures are particularly impactful on the development of self-efficacy beliefs for students with a variety of disabilities (e.g., ADHD; learning disabilities) (Girli & Öztürk, 2017; Martin et al., 2016). These students often need extra academic supports and, as we discussed in Chapter 5, they often will have an IEP in place that specifies the services that will be provided. As teachers, we are part of the IEP planning and implementation process, and we can work collaboratively with parents and colleagues to support the students' continued self-efficacy.

Current Emotional State Learners' current emotional state—for instance, their general mood and the extent to which they feel anxious or stressed—can significantly affect their self-efficacy for a task. For example, a student who feels excessively anxious or agitated during an important academic task may interpret that feeling as a sign of low ability for the task, even if the feeling has come from an unrelated source (Bandura, 1997; Schunk & Pajares, 2005; Usher & Pajares, 2009). The resulting low self-efficacy will, of course, undermine the student's performance, perhaps to the point that the task itself subsequently evokes anxiety and stress.

See Chapter 11 for a discussion of students' anxiety.

Messages from Others When learners' successes aren't obvious, we can enhance their self-efficacy by explicitly pointing out ways in which they've done well previously or are now excelling. Occasionally we may also be able to boost their self-efficacy by giving them reasons to believe they can be successful in the future (Usher & Pajares, 2008). Statements such as, "You can do this problem if you work at it," and "I bet Judy will play with you if you ask her" might give students a slight boost in self-confidence. We also can encourage our students to utilize feedback that is now often provided via technology in various online and computer-based learning environments (Miller et al., 2010). The effects of optimistic predictions will be modest and short-lived, however, unless learners' efforts at a task ultimately *do* meet with success (Schunk, 1989a; Valentine et al., 2004).

See Chapter 11 for a discussion of the benefits of helping students achieve mastery.

Even negative feedback can promote high self-efficacy *if* it gives guidance about how to improve and communicates confidence that improvement is likely—in other words, if it boosts *self-efficacy for learning* (Deci & Ryan, 1985; Narciss, 2008). For example, consider the following statement:

> In the first draft of your research paper, many of your paragraphs don't lead logically to the ones that follow. A few headings and transitional sentences would make a world of difference. Let's find a time to discuss how you might use these techniques to improve the flow of your paper.

The statement indirectly communicates the message, "With a little effort and new strategies, I know you can do better."

Communicate your confidence in students' abilities even in your feedback about students' weaknesses.

Try not to give students more help than they actually need to succeed.

When you offer extra help to students, make the offer privately so that the students are not embarrassed.

In some cases, we communicate our beliefs about learners' competence through our actions rather than our words. For example, if we offer after-school assistance to students who are struggling to master a particular mathematical procedure or musical technique, we're communicating that with a little persistence, improvement is possible. We must be careful not to go overboard, however. If we give struggling students more assistance than they really need, we may inadvertently communicate the message, "I don't think you can do this on your own" (Schunk, 1989b). We also need to be careful not to single out individual students and unintentionally embarrass them by offering extra assistance. For example, if you want to encourage a specific student to come in after school for some extra help, make the suggestion privately, rather than in front of other students.

Successes and Failures of Other Individuals We often form opinions about our probability of success by observing the successes and failures of other people, especially those whose ability levels are similar to our own (Dijkstra et al., 2008; Usher & Pajares, 2008; Zeldin & Pajares, 2000). For example, you're more likely to enroll in an advanced course on philosophy of mind if most of your friends have done well in the course; but if, instead, numerous friends have dropped the course in frustration, you may suspect that your own chances of succeeding are pretty slim.

Another way of enhancing learners' self-efficacy, then, is to point out that others like them have mastered the knowledge and skills at hand (Schunk, 1983, 1989c). For example, a class of chemistry students who seem overwhelmed by the many chemical symbols they must learn might be reassured with a statement such as this:

> I know it seems like a lot to learn in such a short time. My students last year thought so, too, but they found that they could learn the symbols within three weeks if they studied a few new symbols each day.

But even more than *telling* learners about others' successes, *seeing* is believing. Learners who actually observe similar-ability peers successfully reach a goal are especially likely to believe that they can do the same. Hence, students sometimes develop greater self-efficacy when they see a classmate model a behavior than when they see their teacher model it. In one study (Schunk & Hanson, 1985), elementary school students who were having trouble with subtraction were given 25 subtraction problems to complete. Students who had seen another student successfully complete the problems got an average of 19 correct, whereas those who saw a teacher complete the problems got only 13 correct, and those who saw no model at all correctly solved only 8! It may be even more beneficial for students to see one or more peers struggling with a task or problem at first—as they themselves might do—and then eventually mastering it (Kitsantas et al., 2000; Schunk et al., 1987; Schunk & Pajares, 2005). Presumably, observing such a **coping model** shows learners that success doesn't necessarily come easily—that they must work and practice to achieve success—and allows them to observe the strategies the model uses to gain proficiency.

What we *don't* want to do, however, is to *define* success in terms of how students' performance compares with that of their peers—perhaps identifying the "best" writer, science student, or basketball player. Whereas it is tempting to post charts indicating who has read the most books, who is the best behaved, or who ran the fastest in gym class, such comparisons set up competitive situations in which the majority of students must inevitably lose. Most students have higher self-efficacy and achieve at higher levels if they *don't* evaluate their own performance in terms of how they stack up against others (Graham & Golen, 1991; Shih & Alexander, 2000; Stipek, 1996).

Minimize students' awareness of classmates' performance levels.

Successes and Failures as Part of a Group Learners can often think more intelligently and acquire a more complex understanding of a topic when they collaborate with peers to master and apply what they are learning (e.g., Johnson & Johnson, 2009a; Pea, 1993; Slavin, 2011). Collaboration with peers has a possible additional benefit: Learners may have greater self-efficacy when they work in a group rather than alone. Such **collective self-efficacy** depends not only on students' perceptions of their own and others' capabilities but also on their perceptions of how effectively they can work together and coordinate their roles and responsibilities (Bandura, 1997, 2000; Jiang & Guo, 2002; Klassen & Usher, 2010).

See Chapter 13 for discussions of the benefits of cooperative learning activities.

Into the Classroom

Fostering Productive Self-Efficacy Levels

- **Teach basic knowledge and skills to mastery.**

  A biology teacher makes sure all students clearly understand the basic structure of DNA before moving to mitosis and meiosis, two topics that require a knowledge of DNA structure.

- **Assure students that they can be successful at challenging tasks and point out that others like them have been successful in the past.**

  Early in the year, students in beginning band express frustration in learning to play their instruments. Their teacher reminds them that, like themselves, students in last year's beginning band started out with little knowledge but eventually mastered their instruments. A few weeks later, the beginning band class attends a concert at which the school's advanced band (last year's beginning band class) plays a medley from the *Harry Potter* movie series.

- **Have students see peers with similar ability successfully accomplishing challenging tasks.**

  To convince his students from low-income families that they can do almost anything if they put their minds to it, a high school math teacher shows his class the film *Stand and Deliver*. The film depicts the true story of 18 Mexican American high school students from a low-income neighborhood in East Los Angeles who, through hard work and perseverance, earned college credit by taking the Advanced Placement (AP) calculus exam.

- **Help students track their progress on challenging tasks.**

  As first graders are learning how to weave on small circular looms, one student approaches her teacher in tears, frustrated that her first few rows are full of mistakes. The teacher responds, "Look, Katie, this is the history, your own history, of learning to weave. You can look at this and say, 'Why, I can see how I began, here I didn't know how very well, I went over two instead of one; but I learned, and then—it is perfect all the way to the end!'" The student returns to her seat, comforted, and finishes her piece. She follows it with another, flawless one and proudly shows it to her teacher.

- **After students have mastered basic skills, present some tasks at which they can succeed only with effort and perseverance.**

  A physical education teacher tells his students, "Today we've determined how far each of you can go in the broad jump. We'll continue to practice good form a little bit each week. Some of your future efforts will be more successful than others, but let's see if every one of you can jump at least 2 inches farther when I test you again at the end of the month."

- **Have students tackle especially challenging tasks in small, cooperative groups.**

  A fifth-grade teacher has students work in groups of three to write research papers about early colonial life in North America. The teacher makes sure that the students in each group collectively have the skills in library research, writing, word processing, and art necessary to complete the task. She also makes sure that every student has some unique skills to contribute to the group effort.

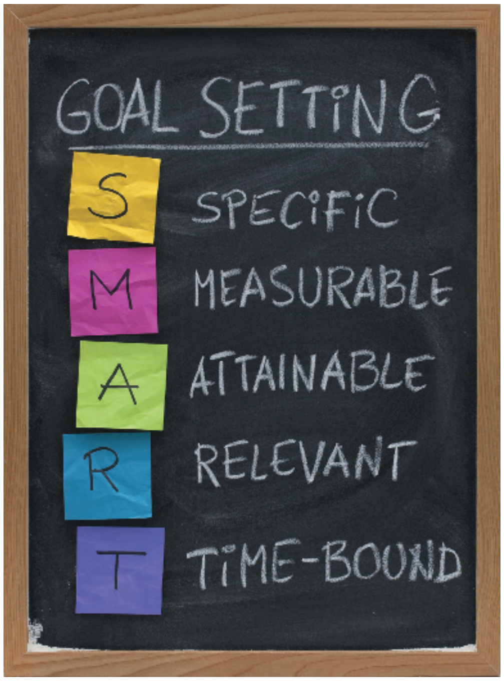
- **Have students set short-term (proximal) goals, so that they can experience success.**

  A Spanish teacher realizes that his students are getting frustrated and feel like they are not learning how to speak or understand Spanish well. He asks them to set short-term goals, rather than focusing on the longer-term goal of learning to speak Spanish. On Monday, he tells his students that "Our goal for the next two weeks is to learn how to count to 20 in Spanish; by the end of the two weeks, you will be able to count forward, backward, by odd numbers, by even numbers, and even to do simple math problems in Spanish." At the end of the two weeks, the students are able to do this, and they feel great about what they have learned. Figure 10.5 is an example of an acronym that can be posted in a classroom to remind students about some things to think about when setting their own goals.

- **If students are unrealistically overconfident—so much so that they don't exert the effort and strategies needed to master the material—help them learn how to accurately evaluate their current knowledge and skill levels.**

  Many students in Mrs. Gifford's class are quite confident that they're solving math problems correctly, even though their grades in the class have been poor. To help them more realistically assess their current understanding, Mrs. Gifford begins giving frequent short quizzes in which students have to predict their ability to correctly solve each problem before actually trying to solve it; they must also evaluate the accuracy of their solutions. Then, when they get back their graded quizzes, they get extra points for critiquing the accuracy of their problem-specific self-evaluations and for explaining and correcting their errors. Students in this class begin to achieve at higher levels.

Figure 10.5 The "SMART" acronym is a useful tool to help your students to remember how to set appropriate goals for themselves.



Marek Uliasz/123RF

SOURCES: Bandura, 1986, 1989, 1997, 2000; Butler, 1998a; Eccles et al., 1998; Friedel et al., 2010; Hawkins, 1997, p. 332 (weaving example); Lodewyk & Winne, 2005; Mathews, 1988; Menéndez, 1988 (*Stand and Deliver* example); Schunk, 1983, 1984, 1989a, 1989c; Usher & Pajares, 2008; Zeldin & Pajares, 2000; Zimmerman & Moylan, 2009 (math example).

Whether we ask students to tackle challenging tasks as individuals or in small groups, we must keep in mind that the school day shouldn't necessarily pose one challenge after another. That would be exhausting, and probably quite discouraging as well. Instead, we should strike a balance between easy tasks, which will boost students' self-confidence over the short run, and the challenging tasks so critical for an optimistic sense of self-efficacy for the long term (Spaulding, 1992; Stipek, 1996). The Into the Classroom feature "Fostering Productive Self-Efficacy Levels" presents several research-based strategies.

Teacher Self-Efficacy

Not only should our students have high self-efficacy about their ability to succeed in the classroom, but so, too, should we teachers have high self-efficacy about our ability to *help* them succeed. Students are more likely to achieve at high levels when their teachers have confidence that they can help students learn (Gordon et al., 2022; Perera & John, 2020; Skaalvik & Skaalvik, 2008; Tschannen-Moran et al., 1998; Ware & Kitsantas, 2007). In fact, teacher efficacy is more strongly related to teachers' effective performance (as judged by independent observers) than are the teachers' personality characteristics (e.g., whether the teacher is outgoing or shy) (Klassen & Tze, 2014). Teachers' sense of efficacy, however, changes over time and situations. Not surprisingly, beginning teachers often feel increasingly confident in their abilities during their teaching practicum but then experience a decrease in their first year of teaching. Knowing that a sudden loss of confidence during the first year is quite common, and that your sense of efficacy will grow again with additional experience can help you cope if this happens to you (Anderman & Klassen, 2016).

Collaborate with colleagues to identify effective ways of fostering *all* students' academic and social success at school.

Some of this teacher confidence may take the form of **collective self-efficacy**: When teachers at a school believe that, as a group, they can make a significant difference in the lives of children and adolescents, their students, too, have higher self-efficacy themselves and are more likely to achieve at high levels (Goddard, 2001; Goddard et al., 2000; Goddard et al., 2017; Salloum, 2022; Tschannen-Moran et al., 1998). When teachers have high self-efficacy about their effectiveness in the classroom—both individually and collectively—they influence students' achievement in several ways:

- They are more willing to experiment with new teaching strategies that can better help students learn.
- They set higher goals for students' performance.
- They put more effort into their teaching and are more persistent in helping students learn.
- They manage problem behaviors (e.g., bullying), more effectively, contributing to a more positive school culture. (Anderman & Klassen, 2016; Bandura, 1997; Guskey, 1988; Klassen & Chiu, 2010; Skaalvik & Skaalvik, 2008; Sørlie & Torsheim, 2011; Tschannen-Moran et al., 1998; Veenstra et al., 2014)

Such effects should look familiar: Just as self-efficacy affects students' choice of activities, goals, effort, and persistence, so, too, does it affect *teachers'* choices, goals, effort, and persistence. And when teachers have high self-efficacy, particularly for instruction and behavior management, they are more satisfied with their jobs (Klassen & Chiu, 2010)!

There are certain things that we, as teachers, can do to facilitate our own feelings of efficacy:

- Collaborate with other teachers. When teachers work together (e.g., planning instruction), they can create cohesive learning environments and reinforce material that is taught in each other's classes. This, then, enhances our confidence in our own teaching, as well as our beliefs in what we can accomplish together. Research suggests that teachers are more collaborative, and that achievement gaps between Black and White students are lower in schools in which teachers report high levels of collective efficacy.
- Seek constructive feedback. As teachers, we sometimes only get feedback from administrators about our teaching once or twice per year; but we can get feedback more often. When we receive feedback on a regular basis and change our practices accordingly, students will notice these changes, and it can improve their attitudes and learning. We can ask other teachers to observe our teaching and give feedback. We also can ask our students for feedback. An easy way to do this is to administer a brief anonymous survey to your students; this can be done with paper, or easily accomplished through readily available websites or applications.
- Keep your students engaged. When teachers ensure that their students are engaged with their work, they are less likely to misbehave, and more likely to learn; consequently, teachers feel more efficacious in classrooms where students are highly engaged and well behaved. We will talk more about motivation and engagement in Chapter 11 and about behavior management in Chapter 12.
- Be willing to examine and change your practices. As teachers, we are always learning. Teachers continuously encounter new challenges. When we accept these challenges as learning experiences, and we change our practices when we discover more effective ones, our efficacy will increase and our students will learn more. (Goddard et al., 2015; Goddard & Kim, 2018; Goddard et al., 2017: Guskey, 1988; Malmberg et al., 2014; Pas et al. 2012).

Many students with special needs can have particular difficulties with motivational beliefs. Chapter 5 identifies specific categories of special needs that fall within the five general categories listed in Table 10.3.

STUDENTS IN INCLUSIVE SETTINGS

Table 10.3 Applying Social Cognitive Theory with Students Who Have Special Educational Needs

Category	Characteristics You Might Observe	Suggested Strategies
Students with specific cognitive or academic difficulties	• Difficulty predicting the consequences of specific behaviors • Low self-efficacy in areas where there has been a history of failure • Difficulty setting appropriate goals	• Help students form more realistic expectations about the consequences of their behaviors. • Scaffold students' efforts on academic tasks to increase the probability of success. • Identify students' areas of strength and give them opportunities to tutor peers in those areas. • Teach self-regulation strategies (e.g., goal setting and planning, self-monitoring).
Students with social or behavioral problems	• Unusual difficulty in learning from models (for many students with autism spectrum disorders) • Difficulties in planning a productive course of action and in predicting the likely consequences of specific behaviors • Friendships with peers who are poor models of effective social skills and prosocial behavior (for some students with emotional and behavioral disorders) • Deficits in social problem solving	• Model appropriate classroom behaviors; combine modeling with explicit verbal instruction and use visual aids to communicate desired behaviors. • Discuss possible consequences of various courses of action when social conflicts arise. • Provide opportunities for students to interact with peers who model effective behaviors. • Help students recognize and interpret other people's body language and other social cues.
Students with general delays in cognitive and social functioning	• Low self-efficacy for academic tasks • Tendency to watch others for guidance about how to behave • Low goals for achievement (possibly as a way of avoiding failure)	• Scaffold students' efforts on academic tasks to increase the probability of success. • Model desired behaviors; identify peers who can serve as good models. • Encourage students to set realistic goals for achievement.
Students with physical or sensory challenges	• Fewer opportunities to develop confidence in doing various tasks independently because of health limitations and/or a tightly controlled environment	• Provide students with alternative strategies that they can implement to enhance their self-efficacy for acting independently (special education teachers and school psychologists can often help you with such strategies).
Students with advanced cognitive development	• High self-efficacy for academic tasks • High goals for performance • A history of easy successes and, hence, little experience dealing productively with failure (for some students)	• Provide the academic support that students need to reach high goals. • Provide opportunities for independent study. • Provide challenging tasks, including some at which students may initially fail; teach constructive strategies for dealing with failure (e.g., using errors to guide future practice efforts).

SOURCES: Asaro-Saddler & Bak, 2014; Bandura, 1989; Bear et al., 2010; Beirne-Smith et al., 2006; Biemiller et al., 1998; Coch et al., 2007; Cunningham & Cunningham, 2006; Dapretto et al., 2006; Ellis & Friend, 1991; Fletcher et al., 2007; Kehle et al., 1986; Meltzer, 2007; Mercer & Pullen, 2005; Nelson et al., 1991; Nikopoulos & Keenan, 2004; Piirto, 1999; Reid et al., 2005; Sands & Wehmeyer, 1996; Schumaker & Hazel, 1984; Schunk et al., 1987; Silk et al., 2003; Sullivan & Conoley, 2004; Turnbull et al., 2010; Usher & Pajares, 2008; Webber & Plotts, 2008; Yell et al., 2001; Zimmerman, 2004.

Revisiting Reciprocal Causation

We return now to a concept introduced earlier in the chapter: reciprocal causation. As we've explored social cognitive theory, we've identified how environmental factors (e.g., reinforcement, teacher scaffolding) can influence learning and motivation. We've also identified personal factors (e.g., self-efficacy) that learners bring with them to new tasks, and those, too, affect learning and motivation. From a social cognitive perspective, all three of these factors—environment, behavior, and person—mutually influence one another (e.g., Bandura, 2008). As a concrete illustration of how environment, behavior, and personal factors are continually intertwined, let's consider the case of a student named Lori:

> Lori often comes late to Mr. Broderick's seventh-grade social studies class, and she's usually unprepared for the day's activities. In class, she spends more time interacting with friends (e.g., whispering, passing notes) than engaging in assigned tasks. Lori's performance on most exams and assignments is unsatisfactory—when she turns in her work at all.
>
> In mid-October, Mr. Broderick takes Lori aside to express his concern about her lack of effort. He suggests that she could do better if she paid more attention. He also offers to work with her twice a week after school to help her understand the material. Lori is less optimistic, describing herself as "not smart enough to learn this stuff."

> For a week or so after meeting with Mr. Broderick, Lori seems to buckle down and exert more effort, but she never does stay after school for extra help. And before long, she's back to her old habits. Mr. Broderick eventually concludes that Lori is a lost cause and decides to devote his time and effort to helping more motivated students.

Lori's low self-efficacy (a *person* factor) is probably one reason she spends so much class time engaged in task-irrelevant activities (*behaviors*). The fact that she devotes her attention (another *person* factor) to her classmates rather than to her teacher affects the particular stimuli she experiences (her *environment*). Lori's non-self-regulating behaviors and resulting poor performance on assignments and exams (*behaviors*) affect both her self-efficacy (*person*) and Mr. Broderick's treatment of her (*environment*). By eventually concluding that Lori is a lost cause, Mr. Broderick begins to ignore Lori (*environment*), contributing further to her failure (*behavior*) and even lower self-efficacy (*person*). In general, Lori is showing signs of being at risk for long-term academic failure.

Now imagine that Mr. Broderick reads several research articles describing effective strategies for working with students like Lori. Midway through the school year, he makes the following changes in his classroom:

- He communicates clearly and consistently that he expects all his students to succeed.
- He incorporates students' personal experiences and interests into the study of social studies.
- He identifies specific, concrete tasks that students will accomplish each week.
- He provides explicit guidance for accomplishing each task.
- To teach simple self-regulation strategies, he asks students to set goals for each learning task, suggests that they reinforce themselves with 15 minutes of a favorite activity after finishing a homework assignment, and shows them how to track their progress on graph paper.
- After consulting with the school's reading specialist and school psychologist, he helps students develop more effective reading and learning strategies.
- He gives a short quiz every Friday so that students can self-assess what they've learned each week.
- When students perform well on weekly quizzes, he reminds them that they themselves are responsible for their performance; when they don't do well, he provides concrete suggestions for specific self-regulatory strategies that they can incorporate the next week.

Revisiting Reinforcement and Punishment

Reinforcement and punishment are less critical in social cognitive theory than they are in behaviorism, but they do have several indirect effects on learning, behavior, and motivation (e.g., Bandura, 1977, 1986; Rosenthal & Zimmerman, 1978). Cognitive factors come into play in these indirect effects, as reflected in the following ideas:

- *Consequences influence behavior only if learners are aware of the response–consequence contingency.* From a social cognitive perspective, reinforcement and punishment affect learners' motivation to engage in various behaviors only if they connect these consequences to specific things they've done (Bandura, 1986). As teachers, we should be very clear about what we're reinforcing and punishing, so that students know the real response–reinforcement contingencies operating in the classroom. For instance, if we give Sam an A on an essay but we don't tell him *why* he's earned that grade, he won't necessarily know how to get an A the next time. Thus, we might accompany the A grade with feedback such as "You followed a logical train of thought and gave three good examples."

  Social cognitive theorists believe that mental processes influence the effects of reinforcement and punishment. If students receive specific feedback about behavior and performance, then they understand and are influenced by the response–reinforcement contingencies in the classroom.

- *Learners form expectations about the likely consequences of future actions and then behave in ways they think will maximize desired results.* Learners often base such **outcome expectations** on existing patterns of reinforcement, nonreinforcement, and punishment. For example, perhaps you've taken a course in which all exam questions came from the textbook, without a single question coming from class lectures. After the first exam, did you find yourself reading the textbook carefully but skipping class a lot? And perhaps you've taken a course in which exams were based almost entirely on lectures. In that situation, did you go to class regularly but hardly ever open your textbook? When a particular response is reinforced every time it's made, learners typically expect to be reinforced for behaving the same way in the future. In a similar manner, when a response frequently leads to punishment—as insulting an instructor or skipping class on a test day might—learners will probably expect that response to be punished on later occasions as well.

  Sometimes, however, learners form expectations about future consequences on the basis of little or no information. For example, a high school student might erroneously believe that bragging about perfect test scores will gain him the admiration of his classmates (i.e., a reinforcer). Another student might believe that her classmates will ridicule and reject (i.e., punish) her for being smart, even though they wouldn't actually do so.

Be explicit about future response–reinforcement and response–punishment contingencies as well.

Be explicit about which behaviors have led to which consequences.

When learners choose to behave in a way that might bring future reinforcement, they're working for an **incentive**, which is never guaranteed. For instance, students never know that they're going to get an A on a test when they study for it or that they'll win a position on the student council simply because they run for office. An incentive is an expected or hoped-for consequence that may or may not actually occur.

- *Learners' expectations are influenced by what happens to other people as well as to themselves.* When one of this book's authors (Jeanne) was in the third grade, she entered a Halloween costume contest dressed as Happy Tooth, a character in several toothpaste commercials at the time. She didn't win the contest; a witch won first prize. So, the following year she entered the same contest dressed as a witch, figuring she was guaranteed first place. She had experienced reinforcement *vicariously* rather than directly—that is, through watching what happened to someone else.

  Learners who observe someone else being reinforced for a behavior are likely to exhibit that behavior more frequently themselves—a phenomenon known as **vicarious reinforcement**. For example, by watching the consequences their classmates' experience, students might learn that studying hard leads to good grades, or that being on a varsity sports team brings status and popularity. Conversely, when they see someone else get punished for a behavior, they're *less* likely to behave that way themselves—a phenomenon known as **vicarious punishment**. For example, when a teacher catches a student using a cheat-sheet on a test and gives that student a failing grade, other students may be less likely to cheat in that class. Unfortunately, vicarious punishment can suppress desirable behaviors as well as undesirable ones. For instance, when a teacher belittles a student's question by calling it "silly," other students may be reluctant to ask questions of their own.[2] As teachers, we must be careful that we don't vicariously reinforce undesirable behaviors or vicariously punish desirable ones.
- *Expectations about future consequences affect how thoroughly and in what ways learners cognitively process new information.* To get a sense of how this might happen, try the next exercise.

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[2] The effects of vicarious reinforcement and vicarious punishment are sometimes referred to as the *response facilitation effect* and *response inhibition effect*, respectively.

Experiencing Firsthand

Planning Ahead

Quickly skim the contents of the upcoming section on expectancies and values to get a general idea of the topics it includes. Once you've done so, imagine yourself in each of these situations:

1. Your instructor announces, "The section on expectancies and values won't be on your test, but please read it anyway." How thoroughly and carefully will you read that section?
2. The next day your instructor announces, "I misled you yesterday. Actually, half of next week's test will be on expectancies and values." *Now* how thoroughly and carefully will you read that section?

If you don't expect to be reinforced for knowing about expectancies and values, you may very well *not* read that section of the chapter. If, instead, you discover that getting an A in your class depends on knowing that material really well, you probably will read the material slowly and attentively, possibly trying to remember every detail. When learners believe they'll be reinforced for learning something, they're more likely to pay attention to it and perhaps engage in elaboration, comprehension monitoring, and other effective cognitive processes. When they *don't* expect to be reinforced for learning something, they're far less likely to process it in any significant way. As an example of the latter situation, let's return to one of the opening case studies. Carrie is convinced that she can't learn how to solve math problems. As a result, Carrie stops paying attention in class. Her low expectations almost guarantee poor performance—a self-fulfilling prophecy.

- *The nonoccurrence of an expected consequence—whether for oneself or for someone else—can have a reinforcing or punishing effect in and of itself.* What happens when learners' expectations aren't met—say, when an expected reinforcement never comes? When, as a fourth grader, Jeanne entered the Halloween costume contest as a witch, she lost once again—this time to a girl wearing a metal colander on her head and claiming to be *Sputnik*, the first satellite launched into space by what was then the Soviet Union. That was the last time she entered a Halloween contest. She had expected reinforcement and felt cheated because she didn't get it. Social cognitive theorists propose that the nonoccurrence of expected reinforcement acts as a form of punishment (e.g., Bandura, 1986). When people think that a certain response is going to be reinforced but the response *isn't* reinforced, they're less likely to exhibit the response in the future.

  Just as the nonoccurrence of expected reinforcement is a form of punishment, the nonoccurrence of expected punishment is a form of reinforcement (Bandura, 1986). Perhaps you can think of a time when you broke a rule, expecting to be punished, but you got away with your crime. Or perhaps you can remember seeing a classmate cheating on a test without getting caught. When nothing bad happens after a forbidden behavior, people may actually feel as if the behavior has been reinforced.

Follow through with the consequences students have been led to expect for certain behaviors.

See Chapter 6 for guidelines and cautions in the use of punishment.

  Thus, when students work hard to achieve a desired result—perhaps a compliment, a high grade, or a special privilege—and the anticipated result doesn't materialize, they'll be less likely to work as hard the next time around. And when students break school rules but aren't punished for doing so, they're more likely to break the rules again—and so are other students who are aware that the behavior has gone unpunished.[3] It's important that we, as teachers, follow through with promised reinforcements for desirable student behaviors. It's equally important that we impose any reasonable consequences students have come to expect for inappropriate behaviors.

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[3] The tendency for learners to engage in forbidden behavior when they see others incur no adverse consequences for behaving that way is known as the *response disinhibition effect*. In this situation, the learners have presumably already mastered the behavior but the expectation of punishment has previously inhibited it. With the expectation no longer present, the behavior is *disinhibited* and may increase in frequency.

COMPARE/CONTRAST

Table 10.4 Comparing the Four Perspectives of Learning

Issue	Behaviorism	Cognitive Psychology	Contextual Theories	Social Cognitive Theory
Learning is defined as . . .	A behavior change	An internal mental phenomenon that may or may not be reflected in behavior	A phenomenon that is often situated within a particular physical or social context	An internal mental phenomenon that may or may not be reflected in behavior
The focus of investigation is on . . .	Stimuli and responses that can be readily observed	Cognitive processes	Various layers of context (e.g., small groups, culture, society) that support learning and development	Both behavior and cognitive processes
Principles of learning describe how . . .	People's behaviors are affected by environmental stimuli	People mentally process new information and construct knowledge from their experiences	Physical, social, and cultural mechanisms influence learning and cognition	People's observations of those around them affect their behavior and cognitive processes
Consequences of behavior . . .	Must be experienced directly if they are to affect learning	Are not a major focus of consideration	Are not a major focus of consideration	Can be experienced either directly or vicariously
Learning and behavior are influenced . . .	Primarily by local environmental conditions	Primarily by cognitive processes within the individual	Both by local environmental conditions and by broader cultural and social factors	Partly by the environment and partly by cognitive processes (people become increasingly self-regulating—and therefore less controlled by the environment—over time)
Educational implications focus on how we can help students . . .	Acquire more productive classroom behaviors	Process information in effective ways and construct accurate and complete knowledge about classroom topics	Acquire complex knowledge and skills within authentic, real-world contexts	Learn by observing others, develop feelings of self-efficacy for academic tasks, and acquire effective self-regulation skills

Comparing Theoretical Perspectives of Learning

Learning Objective 10.4 Compare and contrast perspectives on learning associated with behaviorism, cognitive psychology, contextual theories, and social cognitive theory.

At this point in your study of learning, you may have examined four general theoretical perspectives: cognitive psychology, contextual theories, behaviorism, and social cognitive theory (which is a theory of both learning and of motivation). Table 10.4 identifies central ways in which these perspectives are similar and different. But we urge you to keep this point in mind: *Diverse perspectives of learning often complement rather than contradict one another, and together they give us a richer, more multifaceted picture of human learning than any single perspective can give us by itself.* All four perspectives are supported by research, and provide valuable guidance about how we can help students achieve in classroom settings.

For detailed discussions of the other three theoretical perspectives, see Chapter 6 (behaviorism), Chapter 7 (cognitive psychology), and Chapter 9 (contextual theories).

Would I Want to Do This?

Learning Objective 10.5 Describe the beliefs that students develop about what they find interesting and valuable.

Expectancies and Values

Many motivation-related beliefs and perceptions can be categorized as being related to either *expectancies* for success or *values*. As we discuss different theoretical perspectives, we will refer back to these key categories, even though they may focus on other important ideas. First, however, we discuss those theorists who have focused specifically on expectancies and values for explaining motivation to perform a particular task (e.g., Nagengast et al., 2011; Wigfield & Eccles, 2000; Wigfield & Karpathian, 1991).

This perspective suggests that first, learners must have a high expectation, or **expectancy**, that they'll be successful in a certain subject area (e.g., music) or at a specific task (e.g., learning how to play the piano). This should sound familiar—expectancy beliefs are very similar to self-efficacy beliefs; they help students to answer the question that we examined in the last section of this chapter (*Can I do this*?). Certainly, a student's prior history of success and failure at a particular task—and thus their self-efficacy—has a strong influence. But other factors also affect expectancies, including the perceived difficulty of a task, the availability of resources and support, the quality of instruction, and the amount of effort that will be necessary (Dweck & Elliott, 1983; Wigfield & Eccles, 1992; Zimmerman et al., 1992). From such factors learners come to conclusions—perhaps accurate, perhaps not—about their chances of success.

Equally important and equally subjective is **task value**: Learners must believe there are benefits in performing a task or learning about a subject area. The value of an academic task can be considered in terms of the tasks' perceived utility, importance, interest, and cost (Eccles, 2009; Wigfield & Eccles, 2000). Students' valuing of an academic task is what helps them to answer the question: *Would I Want to Do This*? Some activities have high value because they're seen as a means to a desired goal; that is, they have *utility*. For example, many college students work hard at courses they don't particularly enjoy because they serve as prerequisites for a later course or a particular major. Other activities are valued because they're associated with desirable personal qualities; that is, they're viewed as *personally important* (note that this is different from the idea of being important for a grade or other goal). For example, a boy who sees himself as empathetic may pursue a career in the "helping professions." Still other activities are valued simply because they bring pleasure and enjoyment. (We will discuss research on interest, specifically, in more detail later in the chapter.)

Despite these different types of value, however, we can also envision circumstances in which learners probably won't value an activity very much, often because of perceived *costs*. Some activities may seem to require a lot more effort than they're worth; when our students feel this way, they may be more likely to procrastinate doing their academic work, which can consequently have a deleterious effect on their achievement (Jiang et al., 2018). For example, although you could eventually become an expert on some little-known topic (e.g., the Hector's dolphin of New Zealand), gaining that expertise might require far more time and energy than you're willing to expend. Other activities might seem costly because of their association with bad feelings. For example, if learners become frustrated often enough in their efforts to understand chemistry, they may eventually try to avoid it whenever they can. Finally, some activities might seem valuable but they conflict with other valued activities. For example, a high school student may view studying for a history exam as useful but also want to attend a friend's party; studying then comes at the cost of a preferred activity.

Students are likely to engage in a particular behavior only if they have some expectancy of success *and* find some value in the behavior. Although expectancies and values are both related to achievement, values in particular affect the choices students make—for instance, which courses they select and whether they participate in extracurricular activities (Durik et al., 2006; Mac Iver et al., 1991; Wigfield et al., 2004). And although it's important to value academic content, sometimes students who see great value in a particular academic domain, but also harbor low expectancy for success in that domain, may become frustrated and experience decrements in motivation and achievement (Meyer et al., 2019).

In the early elementary years, students often pursue activities they find interesting and enjoyable, regardless of their expectancies for success (Wigfield, 1994). As they get older, however, their values and expectancies become somewhat interdependent. In particular, students increasingly attach value to activities for which they have a high expectancy for success and that they think will help them meet long-term goals. At the same time, they begin to *devalue* the things they do poorly (Jacobs et al., 2002; Wigfield, 1994), and students' expectancies and values tend to vary across subject areas (Gaspard et al., 2018). Sadly, the value students find in many school subjects declines markedly

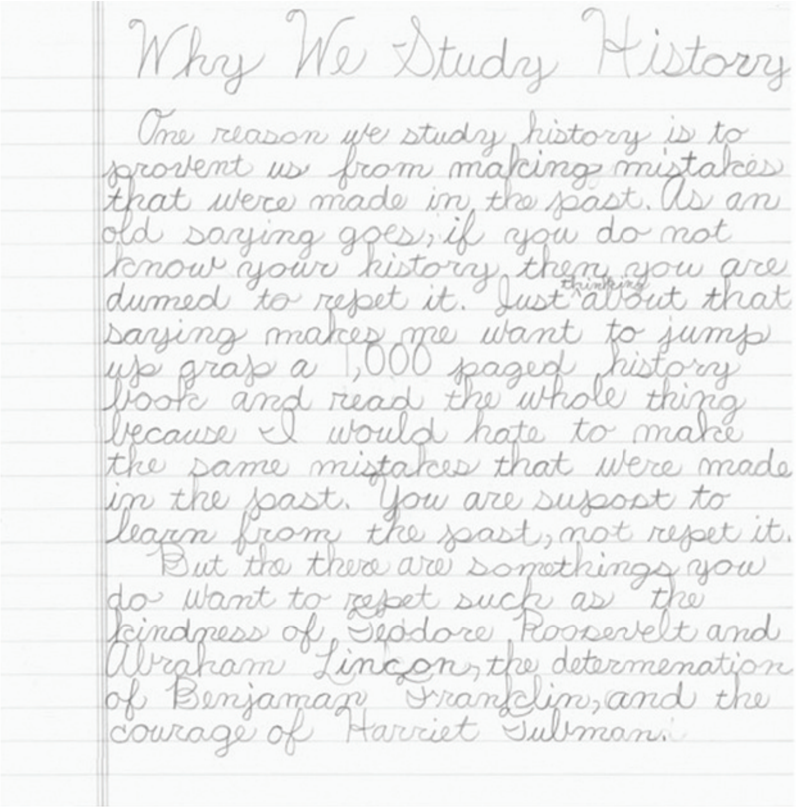
Enhance students' expectancies for success by providing the necessary resources, strategies, and support.

over the school years (Archambault et al., 2010; Jacobs et al., 2002; Wigfield et al., 2004) and many students may value specific occupations but may not see the links between those future career possibilities and more traditional academic subjects (Slot et al., 2021). As one 16-year-old put it, "School's fun because you can hang out with your friends, but I know I won't use much of this stuff when I leave here" (Valente, 2001).

Fostering Expectancies and Values in the Classroom As teachers, we must certainly give students reasons to expect success with classroom tasks—for instance, by providing the resources, support, and strategies they need. But we must also help students find value in school activities. We can't stress enough how essential this is—when students develop positive expectancies for success *and* come to value specific subject areas, they are more likely to pursue careers in those areas later in their lives (Lauermann et al., 2017). Thus, in your work as a teacher, if you can help a student connect to a particular subject area, and help that student to feel successful at learning that content area, that student will be more likely to continue to pursue opportunities in that domain; conversely, negative experiences may cause students to prematurely (and permanently) eliminate a career path from consideration. Here are some suggestions for fostering genuine appreciation for academic subject matter:

- Clearly identify the specific knowledge and skills that students will gain from lessons.
- Convey how certain concepts and principles can help students make better sense of the world around them.
- Ask students to write about how material that they are learning is relevant to their lives. Figure 10.6 displays a brief essay written by a fourth grader about why it is important to study history.

Figure 10.6 It is important for students to believe that what they are learning is useful and important. Here, a fourth grader expresses the reasons why it is important to study history.



Why We Study History

One reason we study history is to provent us from making mistakes that were made in the past. As an old saying goes, if you do not know your history then you are dumed to repet it. Just thinking about that saying makes me want to jump up grap a 1,000 paged history book and read the whole thing because I would hate to make the same mistakes that were made in the past. You are supost to learn from the past, not repet it.

But the there are somethings you do want to repet such as the kindness of Teodore Roosevelt and Abraham Lincon, the determenation of Benjaman Franklin, and the courage of Harriet Tubman.

- Help students relate information and skills to both their present concerns and long-term career goals.
- Embed the use of new skills within the context of real-world (i.e., authentic) and personally meaningful activities.
- Model how you value academic activities yourself—for example, by describing how you apply what you've learned in school, and by explaining how content that you are teaching is relevant to students' own lives.
- Provide examples of individuals who have found that a specific content area was valuable in their own lives (e.g., perhaps by sharing quotes or video recordings) and ask your students to reflect on their own examples.
- Communicate the value of class material to parents and encourage them to reinforce these messages at home.
- Work to maintain positive interpersonal relationships with your students, because conflict with a teacher may indirectly lead to a decrease in students' valuing of a content area that is being taught by that teacher.
- Above all, review curriculum activities critically and refrain from asking students to engage in activities with limited benefits —for instance, having them memorize trivial facts for no good reason or requiring them to read material that is clearly beyond their comprehension levels. (Ames, 1992; Brophy et al., 2009; Cohen et al., 2009; Eccles, 2009; Gaspard et al., 2015a; Hulleman et al., 2010, 2017; Pakarinen et al., 2021; Rozek et al., 2015; Ruiz-Alfonso & León, 2017; Schmidt et al., 2019; Stefanou et al., 2004; Woolley et al., 2013)

Interests

One of the reasons students might value a topic or activity is because they find it interesting. When we say that learners have **interest** in a particular topic, we mean that they find it intriguing and engaging. Interest, then, is a form of intrinsic motivation. Interest is typically accompanied by cognitive arousal and such feelings as enjoyment and excitement (Ainley & Ainley, 2011; Hofer, 2010; Renninger, 2009).

Learners who are interested in a topic devote more time and attention to it and become more cognitively engaged in it—often both in and outside of school (Barron, 2006; Hidi & Renninger, 2006; McDaniel et al., 2000). They're also likely to learn it more meaningfully—for instance, by interconnecting ideas, drawing inferences, and identifying potential applications (Schraw & Lehman, 2001; Tobias, 1994). And unless they're emotionally attached to their current beliefs, learners who are interested in what they're studying are more likely to undergo conceptual change when it's warranted (Andre & Windschitl, 2003; Bernacki & Walkington, 2018; Linnenbrink & Pintrich, 2003; Mason et al., 2008). As you might guess, then, students who are interested in what they study show higher academic achievement, increased use of helpful self-regulatory strategies, and greater self-efficacy; they also are more likely to remember the subject matter over the long run (Garner et al., 1992; Grigg et al., 2018; Hidi & Harackiewicz, 2000; Jansen et al., 2016; Lee et al., 2014; Renninger et al., 1992). In fact, the positive relations between interest and achievement begin during the preschool years (Fisher et al., 2012).

Researchers distinguish between two general types of interest. **Situational interest** is evoked by something in the immediate environment. Things that are new, different, or unexpected often generate interest, as do activities that involve a high activity level or intense emotions. Children and adolescents also tend to be intrigued by topics related to people and culture (e.g., diseases, holidays), nature (e.g., dinosaurs, climate change), and popular media (e.g., YouTube or TikTok videos, games, contemporary music). Works of fiction and fantasy are more engaging when they include themes and characters with which readers can personally identify. Textbooks and other works of nonfiction are more interesting when they're easy to understand and when relationships among ideas are clear. And moderately challenging tasks are often more interesting than easy ones—a fortunate state of affairs if, as Vygotsky proposed, challenges promote cognitive growth (Ainley, 2006; Alexander et al., 2008; Hidi & Renninger, 2006; Hofer, 2010; Schraw & Lehman, 2001; Shernoff & Csikszentmihalyi, 2009; Zahorik, 1994).

Other interests lie within: Learners tend to have personal preferences about the topics they pursue and the activities in which they engage. Such **personal interests** are relatively stable over time and lead to consistent patterns in the choices learners make (Alexander et al., 2008; Nolen, 2007; Tsai et al., 2008; Wijnia et al. 2014). Even in the early elementary grades, many children have specific interests that persist over time—perhaps about reptiles or ballet. Often personal interest and knowledge perpetuate each other: Interest in a topic fuels a quest to learn more, and the increased knowledge and skills gained, in turn, promote greater interest (Barron, 2006; Blumenfeld et al., 2006; Nolen, 2007). Especially in adolescence, long-standing personal interests can be important components of a learner's sense of identity (Barron, 2006; M. Hofer, 2010).

Ask students to apply newly acquired skills to areas of personal interest.

Ultimately, personal interest is more beneficial than situational interest because it sustains engagement, effective cognitive processing, and improvement over the long run. Yet situational interest is important as well, because it captures learners' attention and often provides a seed from which a personal interest can grow (Alexander et al., 1994; Durik & Harackiewicz, 2007; Hidi & Renninger, 2006; Mitchell, 1993; Rotgans & Schmidt, 2017).

Point out to your students why they are studying various subject areas.

Promoting Interest in Classroom Subject Matter As teachers, we can temporarily pique students' interest, and perhaps also stimulate the beginnings of more enduring personal interests through the activities we provide and the ways we present information. We also can capitalize on students' personal interests by allowing some flexibility in the topics about which they read, learn, write, and study. Following are several strategies that often evoke interest:

- Convey excitement and enthusiasm about the usefulness of material.
- Occasionally incorporate novelty, variety, fantasy, or mystery into lessons.
- Encourage students to identify with historical figures or fictional characters and to imagine what these people might have been thinking or feeling.
- Incorporate students' personal interests directly into assignments (e.g., if a student loves skateboarding, try to work skateboards into some physics problems).
- Provide opportunities for students to respond actively to the subject matter—perhaps by manipulating physical objects, collaborating with other students, creating new inventions, debating controversial issues, representing ideas in art or drama, or teaching something they've learned to peers. (Ainley, 2006; Bernacki & Walkington, 2018; Brophy et al., 2009; Certo et al., 2003; Chinn, 2006; Hidi & Renninger, 2006; Hidi et al., 1998; Kunter et al., 2011; Pool et al. 2011; Radel et al., 2010; Walkington, 2013; Wu et al., 2013; Zahorik, 1994)

Figure 10.7 presents examples of how we might promote interest in a variety of content domains.

Brief Motivation Interventions

Over the past few years, researchers have been developing and testing short-term motivation interventions that have demonstrated some promising results. Many of these interventions are aimed at demonstrating the relevance (i.e., value) of academic content to students; the idea is to demonstrate to students that the material that they are learning in class is relevant to their everyday lives, and possibly to future careers. Others are designed to help learners to develop a growth mindset (more about this in the next chapter).

Figure 10.7 Examples of strategies for generating interest in different content domains.

- **Art:** Have students make a mosaic from items they've found on a scavenger hunt around the school building.
- **Biology:** Hold a class debate about the ethical implications of conducting medical research on animals.
- **Geography:** Present household objects not found locally, and ask students to guess where they might be from.
- **Health education:** In a lesson about alcoholic beverages, have students role-play being at a party and being tempted to have a beer or wine cooler.
- **History:** Have students read children's perspectives of historical events (e.g., Anne Frank's diary during World War II, Zlata Filipovic's diary during the Bosnian War).
- **Language arts:** Examine lyrics in popular hip hop music, looking for grammatical patterns and literary themes.
- **Mathematics:** Have students apply their math skills in computer software programs that enable them to create fantasy sports teams or to solve authentic, real-world problems.
- **Music:** In a unit on musical instruments, let students experiment with a variety of simple instruments.
- **Physical education:** Incorporate steps from hip hop, swing, or country line dancing into an aerobics workout.
- **Physical science:** Challenge students to design and construct model airplanes (e.g., out of lightweight balsa wood strips) that will be able to fly a certain distance.
- **Reading:** Turn a short story into a play, with each student taking a part.
- **Spelling:** Occasionally depart from standard word lists, instead asking students to learn how to spell the names of favorite television shows or classmates' surnames.
- **Writing:** Ask students to create children's storybooks related to their own personal interests and experiences.

SOURCES: Some ideas derived from Alim, 2007; Barab, Gresalfi, & Ingram-Goble, 2010; Botelho, Cohen, Leoni, Chow, & Sastri, 2010; Brophy, 1986; A. Collins & Halverson, 2009; Lepper & Hodell, 1989; W.-M. Roth, 2011; Spaulding, 1992; Stipek, 1993; Wlodkowski, 1978.

These interventions may be particularly useful for students who lack confidence in their academic abilities, and thus may not be intrinsically motivated to learn. If students become convinced that a topic that they are learning about (e.g., chemistry) is relevant to their lives or to future job opportunities, they may be more likely to pay attention, exert effort, remain engaged, and increase their interest in a task or a subject area (Hulleman & Harackiewicz, 2009).

Although it is tempting to see these interventions as a quick solution to students' difficulties, we caution you to use them sparingly and cautiously. Such interventions may be helpful to you as supplemental activities, but they should not replace the evidence-based practices that we have reviewed in this chapter. Only a few studies have been conducted on these interventions, and they have not been widely replicated across grade levels or across diverse cultures; thus, while results may be promising, equivalent results might not occur in different contexts. In addition, there is still debate among researchers about the long-term effectiveness of some of these interventions (e.g., Sisk et al., 2018). Examples of three of these interventions are presented in Table 10.5.

Table 10.5 Examples of Brief Interventions Focused on Relevance of Academic Content

Intervention	Results
Ninth-grade students in Germany first listened to a 90-minute presentation about the relevance of mathematics. Students then did one of two writing assignments; they either (a) read and then wrote about quotations from young adults about the relevance of math to their lives, or (b) wrote an explanation about why math is relevant, to a person whom they know.	Commenting on the quotations was related to enhanced self-concept, self-efficacy for doing homework, effort, and math test scores; written explanations were only related to enhanced homework self-efficacy.
Ninth-grade students in the United States wrote about the usefulness of the science course material to their own personal lives.	Students who initially had low expectancies for success became more interested in science and improved their science performance.
High school students' parents in the United States were mailed two brochures: the first was about the usefulness of STEM in everyday life, and the second was about the relevance of STEM for college and future careers. The second also provided information about how parents could talk about the relevance of STEM to their children.	Increased parent–child conversations about the value of STEM; increased valuing of STEM courses by mothers; increased number of STEM courses taken in high school; increased valuing of STEM by students.

SOURCES: Brisson et al. 2017; Hulleman & Harackiewicz, 2009; Harackiewicz et al., 2012.

If I Do This, Will It Meet My Needs?

Learning Objective 10.6 Describe ways in which working on various academic tasks meets students' needs

Basic Human Needs

In considering human motivation, beyond academic motivation specifically, it is useful to remember that our students have certain basic needs they must address related to their physical survival; for example, they must regularly have food, water, and shelter.

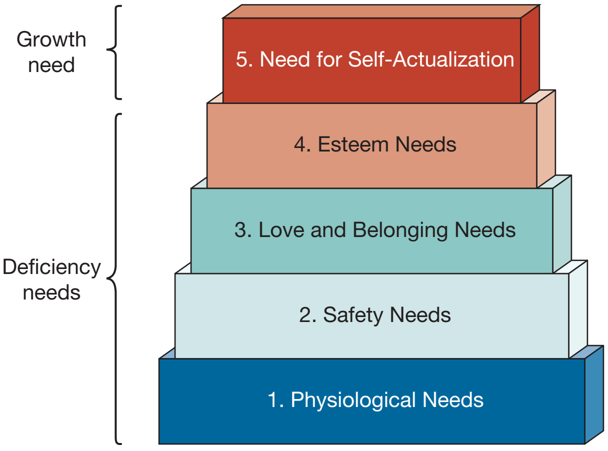
An early model of human needs, proposed by Abraham Maslow, suggested that humans organize their needs in fairly consistent ways (e.g., Maslow, 1943, 1973, 1987). Maslow identified five levels of basic human needs:

1. *Physiological:* Needs related to physical survival (food, water, shelter, etc.)
2. *Safety:* The need to feel safe and secure in one's environment
3. *Love and belonging:* The need to have affectionate relationships with others and to be accepted as part of a group
4. *Esteem:* The need to feel good about oneself (*self-esteem*) and also to believe that others also perceive oneself favorably (*esteem from others*)
5. *Self-actualization:* The need to reach one's full potential—to become all that one is capable of becoming

Maslow proposed these needs are organized to form a hierarchy, as illustrated in Figure 10.8. Specifically, he suggested that individuals try to satisfy their physiological needs first, then the need for safety, and still later their needs for love, belonging, and esteem. Only when such needs have been met do individuals strive for self-actualization, exploring areas of interest, learning simply for the sheer pleasure of it, and so on. Thus, students whose basic needs are insufficiently met are unlikely to be motivated by academic pursuit. For example, one of the authors knew a boy living in a Philadelphia neighborhood who was eager to go to school, but often stayed home to avoid the violent gangs that hung out on the local street corner. This boy's need for safety took precedence over any need for self-actualization he might have had.

Unfortunately, Maslow's hierarchy of needs was based on very little hard evidence; thus, many researchers regard his theory as being more conjecture than fact. Yet aspects of Maslow's theory clearly have some merit. It makes sense that learners will worry about their physical well-being and personal safety before trying to address more social needs (e.g., Kenrick et al., 2010). Many school districts are now offering various health services by opening clinics within or near schools to better support students' mental and physical health (Montgomery et al., 2022). And many people do seem to be eager to gain wisdom or creatively express themselves, consistent with Maslow's idea of self-actualization (Kesebir et al., 2010; Peterson & Park, 2010).

Figure 10.8 Maslow's hierarchy of needs.



Arousal

Human beings appear to have a **need for arousal**—a need for some degree of stimulation (Anderman et al., 2004; Berlyne, 1960; Heron, 1957; Labouvie-Vief & González, 2004). As an example, try the exercise on the next page.

What kinds of reactions did you have during your five-minute break? Did you fidget a bit, perhaps wiggling tired body parts or scratching newly detected itches? Did you interact in some way with something or someone else, perhaps tapping on a table or talking to another person in the room? Did you feel compelled to

Experiencing Firsthand

Take Five

For the next five minutes, you're going to be a student who has nothing to do. *Remain exactly where you are*, put your book aside, and *do nothing.* Spend at least five minutes on this "task."

look at your phone? Did you get out of your seat altogether—something we specifically asked you *not* to do? This exercise, we hope, has shown you that you tend to feel better when *something*, rather than nothing at all, is happening to you.

Not only do people seem to have a basic need for arousal, but they also strive for a certain *optimal level* of arousal at which they feel best (Anderman et al., 2004; Berlyne, 1960; Hsee et al., 2010). Too little stimulation is unpleasant, but so is too much. You might enjoy watching a television show or listening to music, but you'd probably rather not have three TV sets and a live rock band all blasting at you at once. Different people have different optimal levels: Some individuals are *high sensation seekers* who thrive on physically thrilling and possibly dangerous experiences (Cleveland et al., 2005; Reyna & Farley, 2006); others prefer a quieter existence. You'll never catch someone who has a low need for sensation hang-gliding or bungee jumping. Yet even someone who is not a high sensation seeker may still like a lot of *cognitive* stimulation in the form of regular exposure to new ideas, debates about controversial issues, and so on (e.g., see Cacioppo et al., 1996).

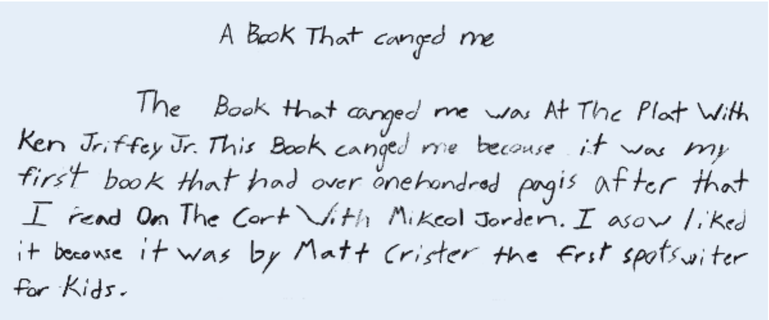
The need for arousal explains some of the motivation behind what our students do in the classroom. For instance, it explains why many students happily pull out a favorite book and read if they finish an in-class assignment before their classmates. But it also explains why students sometimes engage in off-task behaviors—for instance, passing notes and playing practical jokes—during lessons they find boring (Pekrun et al., 2010). Obviously, students are most likely to stay *on* task when classroom activities keep them sufficiently aroused so that they have little need to look elsewhere for stimulation.

Self-Determination

Self-determination theory is a comprehensive theory of human motivation that has been used broadly to explain motivation in academic settings, as well as in numerous other contexts (e.g., health and sports) (Ntoumanis et al., 2021; Teixeira et al., 2012). A central tenet of the theory is that people are more likely to be intrinsically motivated to do something when they feel that their actions are self-determined, rather than when their actions are imposed by someone else or dependent on receiving some type of reward (Deci & Ryan, 1985). Self-determination theorists have identified three basic needs that all of us have: the needs for competence, for autonomy, and for relatedness. When these needs are met, individuals will be more intrinsically motivated to engage in various activities. We will first discuss each of these needs, and then examine how those needs are related to motivation.

The Need for Competence Humans appear to have a **need for competence**—a need to believe they can successfully undertake various tasks and activities (Boggiano & Pittman, 1992; Elliot & Dweck, 2005; Reeve et al., 2004; White, 1959). For example, when children are very young, they spend a great deal of time exploring and trying to gain mastery over various aspects of their world.

A high priority for most people is protecting their general belief that, overall, they're good, capable individuals—something called **self-worth** (Covington, 1992). Occasionally, some individuals seem more concerned about maintaining *consistent*



A Book That canged me

The Book that canged me was At The Plat With Ken Jriffey Jr. This Book canged me becouse it was my first book that had over onehondred pagis after that I read On The Cort With Mikeol Jorden. I asow liked it becowse it was by Matt Crister the frst spotswiter for Kids.

Cristina Dolcino

Mastering new challenges is one important means of gaining a sense of competence and self-worth. In writing about "A Book That C(h)anged Me," 8-year-old Anthony expresses pride in reading his first 100-page book. Notice Anthony's personal interest in sports: *At the Plat(e)* is about baseball, and *On the Co(u)rt* is about basketball.

self-perceptions, even if those self-perceptions are negative (Cassidy et al., 2003; Hay et al., 1999). But for most people, viewing oneself favorably and demonstrating competence to others appear to be high priorities (Rhodewalt & Vohs, 2005; Sedikides & Gregg, 2008; Wilson & Gilbert, 2008).

Other people's judgments and approval play key roles in children's development of a sense of competence and self-worth, especially in the early years (Harter, 1999; Rudolph et al., 2005). Regularly achieving success in new and challenging activities is another important way of maintaining, or even enhancing, a sense of competence and self-worth (Deci & Moller, 2005; Perry et al., 2006; Reeve et al., 2004).

But consistent success isn't always possible, especially when learners must undertake especially difficult tasks. In the face of such tasks, an alternative way to maintain self-worth is to *avoid failure,* because failure gives the impression of low ability (Covington & Müeller, 2001; Urdan & Midgley, 2001). Failure avoidance manifests itself in a variety of ways: Learners might refuse to engage in a task, minimize the task's importance, or set exceedingly low expectations for their own performance (Covington, 1992; Rhodewalt & Vohs, 2005).

When learners *can't* avoid tasks at which they expect to do poorly, they have several strategies at their disposal. They may make excuses that seemingly justify their poor performance (Covington, 1992; Urdan & Midgley, 2001). At times, they also may cheat (Murdock & Anderman, 2006). And they may do things that actually *undermine* their chances of success—a phenomenon known as **self-handicapping**. Self-handicapping takes a variety of forms, including the following:

- *Reducing effort:* Putting forth an obviously insufficient amount of effort to succeed
- *Setting unattainably high goals:* Announcing goals that even the most capable individuals couldn't achieve (so they can"save face" when they don't succeed)
- *Taking on too much:* Assuming so many responsibilities that no one could possibly accomplish them all
- *Procrastinating:* Putting off a task until success is virtually impossible
- *Doing other things:* Engaging in alternative activities instead of the task at hand
- *Using alcohol or drugs:* Taking substances that will inevitably reduce performance (Covington, 1992; Hattie, 2008; Riggs, 1992; Urdan et al., 2002)

It might seem paradoxical that learners who want to be successful would actually try to undermine their own success. But if they believe they're unlikely to succeed no matter what they do—and especially if failure will reflect poorly on their intelligence and ability—such behaviors provide a way to *justify* the failure and thereby protect their self-worth. Self-handicapping is seen as early as elementary school and becomes increasingly common in the high school and college years (Urdan, 2004; Urdan & Midgley, 2001; Wolters, 2003a). Take a moment to reflect on your own experience.

Experiencing Firsthand

Self-Handicapping

We all have probably engaged in some self-handicapping at one point or another in our lives. Think about something that you had to do (e.g., a project for a course), but that you also were nervous about doing because you were uncertain about whether you would be successful. Did you do something to avoid the activity so that you could justify not doing well? If you did, that's an example of self-handicapping.

Enhancing Students' Sense of Competence Strategies for enhancing students' self-efficacy or expectancies for success should increase their sense of competence and self-worth. Following are three widely recommended strategies:

- Help students achieve genuine success (rather than giving them hollow praise), especially on challenging tasks; make sure that students understand why they were successful (i.e., specifically what about their work is noteworthy).
- Give students concrete mechanisms through which they can track their progress over time, such as setting short-term goals and assessing whether those goals have been reached.
- Minimize competitions, public sharing of grades, and other situations in which students might judge themselves unfavorably in comparison with peers.

Ideally, learners' sense of competence should be based on a reasonably accurate appraisal of what they can and cannot accomplish. Learners who underestimate their abilities set unnecessarily low goals for themselves and give up easily after only minor setbacks. Those who overestimate their abilities—perhaps because they've been lavished with praise by parents or teachers or because assignments have been consistently easy and unchallenging—may set themselves up for failure by forming unrealistically high expectations, exerting insufficient effort, or not addressing their weaknesses (Försterling & Morgenstern, 2002; Hattie & Gan, 2011; Paris & Cunningham, 1996; Stevenson et al., 1990).

As teachers, we're more likely to encourage students to tackle realistically challenging tasks—and thus enhance their sense of competence and intrinsic motivation—when we create an environment in which they feel comfortable taking risks and making mistakes (Clifford, 1990; Fredricks et al., 2004). Once students are intrinsically motivated, they seem to *prefer* challenges rather than easy tasks (Csikszentmihalyi et al., 2005; Reeve, 2006; Shernoff & Csikszentmihalyi, 2009). In general, challenges and intrinsic motivation mutually enhance one another, leading to a cycle of positive change.

Create an environment that encourages students to take academic risks—for instance, through the kinds of feedback you give and the criteria you use to assign grades. Make sure students know that they won't be punished or hurt their grade by taking such risks.

We must keep in mind, however, that academic achievement isn't always the most important thing affecting students' sense of competence and self-worth. For many students, such factors as physical appearance, peer approval, and social success are more influential (Eccles et al., 1998; Rudolph et al., 2005). To the extent that we can, then, we should support students' successes in the nonacademic as well as the academic aspects of their lives.

Help students achieve a sense of competence in social as well as academic activities.

The Need for Autonomy The **need for autonomy** reflects a desire for self-direction regarding the things students do and the courses their lives take (d'Ailly, 2003; deCharms, 1972; Reeve et al., 2004; Ryan & Deci, 2000). When we think, "I'm doing this because I *want* to" or "because I chose to," we have a high sense of autonomy. In contrast, when we think, "I *have to*" or "I *should*," we're telling ourselves that someone or something else is making decisions for us. The following exercise provides an example.

Experiencing Firsthand

Painting Between the Lines

Imagine that we give you a paintbrush, a set of watercolor paints, two sheets of paper (a fairly small one glued on top of a larger one), and some paper towels. We ask you to paint a picture of your house, apartment building, or dormitory and then give you the following instructions:

> You have to keep the paints clean. You can paint only on this small sheet of paper, so don't spill any paint on the big sheet. And you must wash out your brush and wipe it with a paper towel before you switch to a new color of paint, so that you don't get the colors all mixed up. In general, don't make a mess with the paints. (Koestner et al., 1984, p. 239)

How much fun do you think your task would be? After reading our rules, how eager are you to begin painting?

Our rules about painting are quite *controlling*; they may well undermine any intrinsic motivation you might have to paint the picture, and you'd probably be less creative in your painting than you might be otherwise (Amabile & Hennessey, 1992; Koestner et al., 1984; Reeve, 2006).

Students who have a sense of autonomy while doing their schoolwork are more likely to be intrinsically motivated during classroom activities, to achieve at high levels, and to complete high school (Boncquet et al., 2020; Hardré & Reeve, 2003; Patall et al., 2018; Reeve et al. 1999; Reeve & Cheon, 2021; Shernoff et al., 2000; Vansteenkiste et al., 2006). When students are working on challenging tasks that may lead to feelings of frustration, providing them with opportunities to be autonomous can lessen those frustrations (Baten et al., 2020). Even kindergartners seem to prefer classroom activities of their own choosing (Langer, 1997). Students notice when they are not provided with opportunities in the classroom that support their autonomy, and this can result in decreased engagement in classroom activities (Cheon et al., 2019).

Enhancing Students' Sense of Autonomy As teachers, we cannot and should not give students total freedom about what they will and won't do in the classroom. Nevertheless, we can apply several strategies to enhance students' sense of autonomy at school:

- *Provide opportunities for independent work and decision making.* It is easy to get used to simply telling our students what to do and when to do everything. We encourage you to think about situations in which you can let the students make decisions, instead of just telling them what to do. For instance, let's suppose that you plan to cover two short stories in your class, over a two-week period. Most of us would probably choose one short story, and have the class read and discuss that story during the first week, then move on to the second story the next week. However, there is another way to think about this—instead, the teacher could say, *"We are going to be reading two stories over the next two weeks. I'm going to describe each one for you. Then I'd like you to decide which story you'd like to read during the first week, and which story you'd like to read during the second week. Then we'll set up schedules for you depending on your choice, so you can read these in the order that you prefer."* You would certainly have to rethink some aspects of how you would organize this within your planning, but in the end, all the students will have read both stories; the difference is that they were able to express some autonomy in this process. Now let's take this one step further; suppose you provided the students with three stories, and told them that they could select two, and read one the first week and one the next week. If all three stories are of high quality, then students would feel even more autonomous, since each student could choose the two stories that are of greatest interest to them. We also can give students considerable autonomy in extracurricular activities (Larson, 2000; Patall et al., 2018; Stefanou et al., 2004; Swan et al., 1990).

  Providing autonomy in activities doesn't mean removing all structure, however. Some scaffolding—tailored to students' developmental levels, of course—can further increase students' sense of autonomy. For example, we can establish general routines and procedures that students should follow as they work, thereby minimizing the need to give explicit instructions for every assignment. And we should describe our evaluation criteria in advance so that students know exactly what they'll need to do to be successful (Ciani et al., 2010; Jang et al., 2010; Spaulding, 1992; Wang & Holcombe, 2010).

  One way to provide students with autonomy is to allow them to choose which questions to answer on tests. One of the authors used to give multiple-choice tests that did not offer students any choices. Thus, instructions would read, "Answer the following 30 questions." However, an alternative was to give the students 30 questions, and instruct them to "Answer any 27 of the following 30 questions." Students could thus choose to skip any three questions (they did not get extra credit for answering the additional three items). Students greatly preferred to be able to choose which items to answer. Interestingly, students also seemed to take more ownership of incorrect answers; when students answered a question incorrectly, they knew that they had made the deliberate choice to answer the question, and often seemed to see the mistake as a learning opportunity. However, although this approach may enhance motivation, a downside is that it also reduces standardization of the test, which is important when a test is used for *summative* assessment purposes.

Some other examples of choices students can be encouraged to make include:

- Rules and procedures to make the class run more smoothly
- Specific topics for reading or writing projects
- Sequencing or due dates of assigned tasks
- Ways of achieving or demonstrating mastery of a particular skill (e.g., see Figures 10.9 and 10.10)
- Criteria by which some assignments will be evaluated (Ciani et al., 2010; Fairweather & Cramond, 2010; Meece, 1994; Patall et al., 2010; Reed et al., 2004; Schmidt et al., 2009)

When students can make choices about such matters, they gain a sense of ownership about classroom activities, are more likely to be interested and engaged in what they're doing, and take pride in their work (Deci & Ryan, 1992; Flunger et al., 2019; Nolen, 2011; Patall et al., 2010; Schraw et al., 2001; Stefanou et al., 2004).

The necessity for standardization in summative assessments is discussed in Chapter 14 and Chapter 15.

Present rules and instructions in an informational rather than controlling manner. Virtually every classroom needs a few rules and procedures to ensure that students act appropriately and activities run smoothly. The challenge is to present these rules and procedures without communicating a message of *control.* Instead, we can present them as *information*—for instance, as conditions that can help students accomplish objectives (Deci, 1992; Koestner et al., 1984; Reeve, 2009). Here are two examples:

- *Informational:* "We can make sure everyone has an equal chance to speak and be heard if we listen without interrupting and if we raise our hands when we want to contribute to the discussion."

Figure 10.9 In this assignment, a sixth-grade language arts teacher enhances students' sense of autonomy by offering several options for demonstrating understanding of a science fiction book.

Choose One!

SCIENCE FICTION BOOK PROJECTS

_____ Write a "Dear Abby" letter from one of the main characters, in which he or she asks for advice on solving his or her main problem. Then answer the letter.

_____ Draw a time line of the main events of the book.

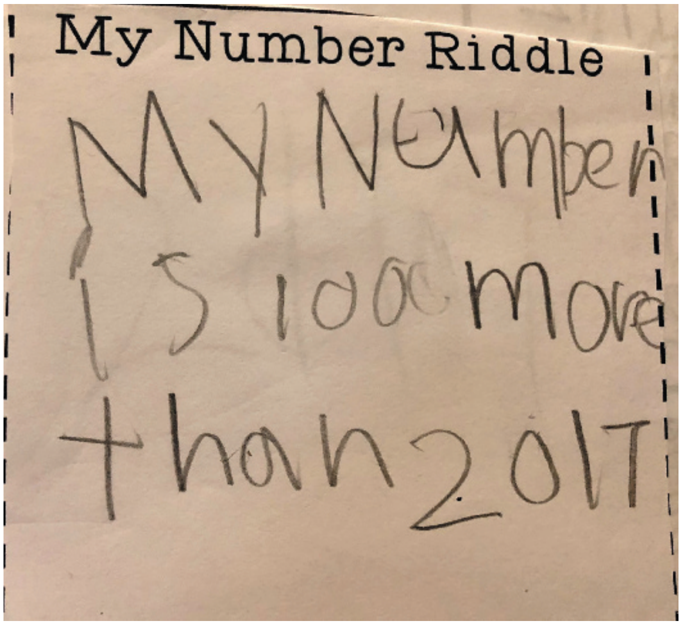
_____ Create a comic book or a comic strip page that features a major scene from the book in each box.

_____ Make a collage of objects and printed words from newspapers and magazines that give the viewer a feeling for the mood of the book.

_____ Your book probably takes place in an unusual or exotic setting, so illustrate and write a travel brochure describing that location.

_____ Imagine yourself as a scientist who has been asked to explain the unusual events in the book. Write up a report in scientific style.

_____ With other students who have read the same book, plan a bulletin board display. Write a plot summary; character and setting descriptions; discussions of special passages. Each group member must contribute one artistic piece—for example, new book cover, bookmark, poster, banner, some of the ideas listed above. Arrange the writing and artwork under a colorful heading announcing the book.



My Number Riddle

My Neamber is 100 more than 2017

Figure 10.10 In this activity, a first-grade teacher asks students to come up with their own number riddle to practice math skills; students may choose any type of math problem to express in their riddle.

Yujin Chang

- *Controlling:* "I'm giving you a particular format to follow when you do your math homework. If you use this format, it will be easier for me to find your answers and to figure out how I can help you improve."
- We should also acknowledge students' feelings about things they must do but would rather *not* do—thus communicating the message that their opinions matter (Deci & Ryan, 1985; Reeve, 2009).

- *Evaluate students' performance in a noncontrolling way.* As teachers, we must regularly evaluate students' progress. Nevertheless, external evaluations can undermine students' intrinsic motivation, especially if they're communicated in a controlling manner (Deci & Moller, 2005). Ideally, we should present evaluations of students' work not as judgments to remind students of how they *should* perform but as information that can help them improve their knowledge and skills. And, of course, we can give students criteria by which they can evaluate *themselves.*
- *Provide opportunities for autonomy equitably for all students.* Students should not see opportunities to make independent decisions as a privilege for some students. When students perceive that autonomy-supportive instructional practices are not allocated equitably, they become disengaged and ultimately experience a decrease in achievement (Chatzisarantis et al., 2019).

The Need for Relatedness The **need for relatedness** reflects the need to feel socially connected and to secure the love and respect of others (Connell & Wellborn, 1991; Fiske & Fiske, 2007; Reeve et al., 2004; Ryan & Deci, 2000). The need for relatedness seems to be especially strong in adolescence: Most teens spend a great deal of time interacting with peers, through face-to-face activities or via social media (Barron, 2006; Ito et al., 2009; Ryan & Patrick, 2001; Valkenburg & Peter, 2009).

At school, the need for relatedness manifests itself in a variety of ways. Some students place a higher priority on interacting with friends than on getting schoolwork done (Dowson & McInerney, 2001; Doyle, 1986; Wigfield et al., 1991). They may also be concerned about projecting a favorable public image—that is, looking smart, popular, athletic, or cool. By looking good in the eyes of others, students not only satisfy their need for relatedness but also enhance their sense of self-worth (Harter, 1999; Juvonen, 2000). Yet another way in which they might address the need for relatedness is to work for the betterment of others—for example, by helping peers who are struggling with assignments (Dowson & McInerney, 2001; Lawlor & Schonert-Reichl, 2008; Thorkildsen et al., 2008).

When the need for relatedness is satisfied, students feel a sense of **belonging** in their schools. School belonging is related to many important academic outcomes, including sustained academic engagement, academic motivation, and school completion (Anderman & Freeman, 2004; Neel & Fuligni, 2013; Niehaus et al., 2016). Feeling a sense of school belonging is particularly important for minoritized students; when minoritized students feel like they belong at their schools, they may be less likely to be absent and may exert greater effort (Sanchez et al., 2005).

Enhancing Students' Sense of Relatedness and School Belonging Students are more likely to be academically motivated and successful—and more likely to stay in school rather than drop out—when they believe that their peers and teachers like and respect them, and care about their learning (Christenson & Thurlow, 2004; Furrer & Skinner, 2003; Patrick et al., 2002; Roorda et al., 2011). Ideally, we should find ways to help students simultaneously learn *and* address their eagerness to interact with peers. Group-based activities—such as cooperative learning tasks, role-playing, and small discussion groups —provide the means through which students can satisfy their need for relatedness while also acquiring new knowledge and skills (Blumenfeld et al., 2006; Johnson & Johnson, 2009a; Wentzel & Wigfield, 1998).

Give students frequent opportunities to interact as they study classroom topics.

Students' relationships with their teachers are just as important. Thus, we should show students that we enjoy being with them and are concerned about their academic achievement and personal well-being (Chang & Davis, 2009; Meyer & Turner, 2006; Roorda et al., 2011). We can communicate our fondness and concern for them in numerous ways—for example, by expressing interest in their outside activities, providing extra help when they need it, and lending a sympathetic ear in stressful times. Such caring messages are especially important for students who are at risk for academic failure and dropping out of school (Anderman et al., 2011; Christenson & Thurlow, 2004; Hamre & Pianta, 2005; Pianta, 1999).

It is particularly important to demonstrate academic (or "pedagogical") caring to our students (Wentzel, 1997). Students' motivation can be greatly enhanced when they believe their teacher cares about their individual learning. Academic caring can be conveyed to any student—even high-achieving students who often may be taken for granted. One of the authors of this book, who generally earned high grades in math, recalls an incident when a high school math teacher pulled him aside and said, "You only got a 90% on the unit test; what was going on with you, is anything wrong? I know you can do better than that." Although such statements may seem trivial, they demonstrate that we, as teachers, really notice what's going on with individual students.

Continually communicate the message that you like and respect your students.

Diversity in Addressing Needs

The basic needs described earlier (e.g., Maslow's hierarchy and the need for arousal) are probably universal among people throughout the world (e.g., Bao & Lam, 2008; Berlyne, 1960; Deci & Moller, 2005; Fiske & Fiske, 2007). However, researchers have identified distinct cultural differences in how people strive to address the three more sociocognitive needs specifically included in self-determination theory.

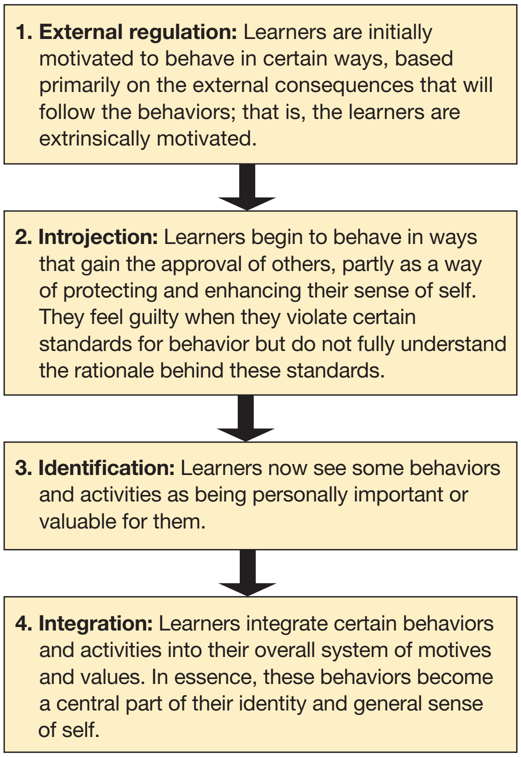
Achieving a Sense of Competence In mainstream Western culture, achieving a sense of self-worth often involves *being good at* certain things and also *thinking* that one is good at these things. In such a context, learners sometimes engage in self-handicapping as a means of justifying poor performance. But not all cultures stress the importance of positive self-evaluations. For instance, many people in East Asian cultures place greater importance on how well other people view an individual as living up to society's standards for behavior. In such cultures, the focus is more likely to be on correcting existing weaknesses—that is, on *self-improvement*—than on demonstrating current strengths (Heine, 2007; Li, 2005; Sedikides & Gregg, 2008).

Achieving a Sense of Autonomy The amount and form of autonomy seen as appropriate may differ considerably from group to group (d'Ailly, 2003; Fiske & Fiske, 2007; Rogoff, 2003). For example, adults in some Native American groups (e.g., those living in the Navajo Nation in the southwestern United States) give children more autonomy and control over decision making than do many adults in mainstream Western culture (Deyhle & LeCompte, 1999). In contrast, some Asian and Black parents give children *less* autonomy than other American adults, in some cases as a way of ensuring children's safety (McLoyd, 1998; Qin et al., 2009; Tamis-Lemonda & McFadden, 2010).

Cultural differences have also been observed in one important aspect of autonomy: opportunities to make choices. In particular, although young people around the world find choice-making opportunities highly motivating, some students from Asian cultures prefer that people they trust (e.g., parents, teachers, respected peers) make the choices for them (Bao & Lam, 2008; Hufton et al., 2002; Iyengar & Lepper, 1999).

Achieving a Sense of Relatedness Researchers have found several cultural differences in how children and adolescents address their need for relatedness. For example, students from many cultural and ethnic groups have especially strong loyalties to family and may have been brought up to achieve for their respective communities, rather than just for themselves as individuals. Motivating statements such as "Think how proud your family will be!" and "If you get a college education, you can really help your community!" are likely to be especially effective for such students (Chiu & Hong, 2005; Fiske & Fiske, 2007; Kağitçibaşi, 2007; Timm & Borman, 1997).

Figure 10.11 Sequence in which internalized motivation may develop.



1. External regulation: Learners are initially motivated to behave in certain ways, based primarily on the external consequences that will follow the behaviors; that is, the learners are extrinsically motivated.

2. Introjection: Learners begin to behave in ways that gain the approval of others, partly as a way of protecting and enhancing their sense of self. They feel guilty when they violate certain standards for behavior but do not fully understand the rationale behind these standards.

3. Identification: Learners now see some behaviors and activities as being personally important or valuable for them.

4. Integration: Learners integrate certain behaviors and activities into their overall system of motives and values. In essence, these behaviors become a central part of their identity and general sense of self.

SOURCE: Based on Deci & Moller, 2005; Deci & Ryan, 1995.

The need for relatedness can sometimes be at odds with the need for autonomy. In particular, achieving relatedness can involve doing what *others* want one to do, whereas achieving autonomy involves doing what one *personally* wants to do. Sometimes people resolve this apparent conflict by willingly agreeing to adjust personal behaviors and goals to meet social demands and maintain overall group harmony (Iyengar & Lepper, 1999; Kağitçibaşi, 2007; Li & Fischer, 2004; Savani et al., 2010).

Internalizing Values and Motivational Beliefs of One's Social and Cultural Groups As children grow older, they tend to adopt many of the values and beliefs that they encounter in their experiences with their families, their schools, their peers, and their larger cultures. Such **internalized motivation** typically develops gradually over the course of childhood and adolescence, perhaps in the sequence depicted in Figure 10.11 (Deci & Moller, 2005; Deci & Ryan, 1995; Ryan & Deci, 2000). Initially, children may engage in certain activities primarily because of the external consequences that result. For instance, they may do schoolwork to earn praise or to avoid being punished for poor grades. With time, other people's approval becomes increasingly important for children's sense of self. Eventually children begin to internalize the pressure to perform certain activities and to see these activities as important in their own right. Such internalization of values is most likely to occur if adults who espouse those values (parents, teachers, etc.) do the following:

- Engage in and thereby model valued activities themselves.
- Provide a warm, responsive, and supportive environment (addressing children's need for relatedness).

- Allow for some autonomy in decision making (addressing children's need for autonomy).
- Set reasonable limits for behavior and provide information about why certain behaviors are important. (Deci & Moller, 2005; Eccles, 2007; Gniewosz & Noack, 2012; Jacobs et al., 2005; R. M. Ryan et al., 1992; Ryan & Deci, 2000)

Point out the value of students' school achievement for their families and communities.

Fostering the development of internalized motivation, then, involves striking a delicate balance between giving students opportunities to experience autonomy and providing guidance about desired behaviors.

Find a reasonable balance between giving students autonomy in their actions and imposing reasonable limits on their behavior.

The more students have internalized the value of learning and academic success, the better their overall classroom achievement is likely to be. Internalized motivation is also an important aspect of self-regulated learning: It underlies a general work ethic in which learners spontaneously engage in activities that, although not always fun or immediately gratifying, are essential for reaching long-term goals (Assor et al., 2009; La Guardia, 2009; Ratelle et al., 2007; Ryan, et al., 1992; Walls & Little, 2005). In fact, when ethnically diverse students, in particular, internalize the values associated with a particular career, they are more likely to intend to enter that career (Estrada et al., 2011).

Students also may internalize stereotypes that can undermine their motivation and achievement. For example, students may internalize stereotypical beliefs about gender differences (e.g., that boys are good at math and girls are good at language arts) in ways that negatively impact their expectancies for success and valuing of tasks. Thus, a female student may hear societal messages about boys being better at math than girls; however, the stereotype will hurt her achievement only if that message leads to changes in her motivational beliefs (Plante et al., 2013).

Chapter 10 What Have You Learned?

We now return to the chapter's learning outcomes to summarize key concepts, principles, and applications of students' confidence, values and needs

10.1 Describe the nature of academic motivation. Motivation directs behavior toward particular goals and leads to increased effort and energy in pursuit of those goals. Motivation increases the initiation of and persistence in activities, even in the face of distractions and obstacles. Motivation also affects cognitive processes, such as attention, reflection, and elaboration on academic content.

10.2 Describe three major categories of motivational beliefs. Three categories of motivational beliefs are: confidence (can I do this?), values (do I want to do this?), and needs (will doing this meet my needs?)

10.3 Use a social cognitive perspective to explain how students' beliefs about their abilities in various areas develop. Social Cognitive Theory is used to explain how students learn, and also to explain some aspects of students' motivation. It assumes that motivation and learning are influenced by behavioral, environmental, and personal factors. Students' beliefs about their abilities (their self-efficacy) can reflect their success experiences in setting and meeting goals. Their beliefs can also be developed through observation of models and vicarious reinforcement. Students can be supported by helping them set short-term goals and monitoring their progress, and by helping them choose appropriate models and supportive contexts.

10.4 Compare and contrast perspectives on learning associated with behaviorism, cognitive psychology, contextual theories, and social cognitive theory. Behaviorism, cognitive psychology, contextual perspectives, and social cognitive theory sometimes share and build upon each other's ideas but, in other respects, they offer competing views of how we learn. Key differences among the four perspectives include their definitions of learning; their emphases on mental processes, influences of stimuli and consequences to one's immediate environment or broader social and cultural contexts; and the specific implications they suggest for instruction. As teachers, we must keep in mind that all four perspectives have useful applications for classroom practice.

10.5 Describe the beliefs that students develop about what they find interesting and valuable. Expectancy-Value Theory proposes that there are three categories of beliefs about activities or academic content that explain why students value those tasks: because they find the work interesting and enjoyable in its own sake (interest value); because the knowledge will be useful for other, future courses or activities (utility value); and because they perceive the activity as consistent with their self-image. Interest can be either *situational*, triggered by something unexpected or engaging in the particular task, or *personal*, which refers to longer-term investment in an activity or topic across contexts.

10.6 Describe ways in which working on various academic tasks meets students' needs. Self-Determination Theory suggests that all people have three basic psychological needs: the need to feel competent, the need to experience autonomy, and the need to feel socially connected with others (i.e., relatedness). Students' feelings of competence can be enhanced when they tackle challenging but realistic tasks in an environment where they feel safe taking academic risks. The need for autonomy is met when students have a sense of self-direction in the classroom, through appropriate opportunities for choice, and through an environment that allows for differing perspectives and approaches to tasks. The need for relatedness is supported when students feel accepted and respected for who they are and have warm relationships with teachers and peers.

Practice for Your Licensure Exam

Bored Students

Mrs. Lee and Mr. Anderson both teach high school chemistry. They are using the same textbook and the same curriculum, and usually cover the same topics each day. The school counselor has heard from many of Mr. Anderson's students that they are very bored in his class, and that they don't really understand why they have to learn chemistry. The school counselor also talks to students in Mrs. Lee's class, and she hears a very different story—Mrs. Lee's students seem to love her class. One of Mrs. Lee's students said "I never realized how much chemistry plays a part in our everyday lives." The school counselor asks if she can observe both of these teachers' classes for several days. She discovers that Mr. Anderson uses a lot of technical chemistry vocabulary without clearly defining new terminology, and he doesn't provide students with many examples that they can relate to. In contrast, she notes that Mrs. Lee regularly uses foods and household items to provide examples of how chemistry plays a part in our everyday lives. For example, during one lesson, Mrs. Lee uses chemistry to explain why it is extremely dangerous to mix ammonia with bleach.

Which of the following statements best uses principles from expectancy-value theory to explain why the students in Mrs. Lee's class have more positive attitudes than the students in Mr. Anderson's class?

- **a.** Mrs. Lee's use of relevant examples increases her students' expectancies for being successful at learning chemistry.
- **b.** Mr. Anderson's students find his class boring because his lessons do not meet his students' need for relatedness.
- **c.** By using relevant examples, Mrs. Lee's lessons highlight the value of learning chemistry.
- **d.** Mr. Anderson's students have lower self-efficacy for learning chemistry than do Mrs. Lee's students.

2. Constructed-response question:

What might Mr. Anderson do to make his class more enjoyable for his students? Would these changes affect Mr. Anderson's students' motivation and academic achievement in chemistry, or just their motivation? Why?

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 11

Motivation, Affect, and Engagement

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Learning Objectives

11.1 Explain how learners’ goals impact their motivation and learning.

11.2 Explain how learners’ beliefs about why they did or did not succeed at various tasks impact their motivation and learning.

11.3 Describe how teachers’ beliefs and behaviors affect student motivation.

11.4 Explain the similarities and differences between motivation and engagement.

11.5 Describe how various forms of affect are intertwined with motivation, learning, and cognition, and explain how you might promote productive affective states in students.

11.6 Explain how ideas from different theories can be used to motivate your students.

CASE STUDY

Elias is in the seventh grade. Students in Elias's school district can start taking a foreign language in either the seventh grade or the ninth grade. Elias decided to start taking Spanish during the seventh grade, along with some of his friends. Although he started the year excited about learning a new language, Elias's experiences in his Spanish class were not entirely positive.

During the first week of school, Elias's Spanish teacher (Señora Martin) excitedly tells the students that by the end of the second week of school, they'll be able to count to 20 (even backwards!) in Spanish, and to do simple math problems in Spanish. Señora Martin begins teaching the students how to say and write the numbers (from zero through 20) on the second day of school, and she practices them with her students daily. Although many of his classmates seem to have learned how to speak, write, and manipulate numbers in Spanish by the end of the second week, Elias is feeling quite frustrated and upset. He has not memorized the numbers, and he keeps mixing them up and making mistakes. Elias is concerned that he will look "dumb" compared to many of his classmates when the teacher asks him to count or add in Spanish. During dinner on the Friday evening of the second week of school, when his parents ask him how Spanish is going, he says, "Terrible. I'm just not good at learning new languages. Maybe I should have waited until ninth grade to take Spanish. I'm not smart enough to learn this stuff."

Although Elias initially was motivated to learn Spanish, by the end of the second week of class, he is clearly feeling a range of emotions (mainly negative ones). He soon came to doubt that he could learn Spanish as well as his peers. Elias also is thinking about how he compares to his classmates, worrying that he will look "dumb" compared to other students.

In Chapter 10 we examined how students answer questions about their beliefs about their abilities (*Can I do this?*), their valuing of what they are learning (*Would I want to do this?*), and the extent to which their academic work meets their needs (*If I do this, will it meet my needs?*). While Elias may have considered those questions, some other aspects of motivation come to mind as well in this situation. For example, Elias's experience in his Spanish class might be related to the goals that both he and his teacher set with regard to learning Spanish; Elias's goal might be to not "look dumb," rather than to learn the numbers. In addition, after the first two weeks of class, Elias probably has come to some conclusions about why he is experiencing difficulties in this class. As he tells his parents, "I'm not smart enough to learn this stuff." He also might wonder about the impression that he is making on Señora Martin, possibly wondering if she also thinks that he does not have what it takes to learn Spanish. And it was quite clear that Elias's experiences led to some negative emotions.

In this chapter, we'll examine student motivation further by considering some of Elias's experiences. We again frame these in terms of questions that students might ask themselves.

What Is My Goal When I'm Doing This?

Learning Objective 11.1 **Explain how learners' goals impact their motivation and learning.**

Much of human behavior is directed toward achieving particular goals. Some goals are short term and transitory (e.g., "I want to finish reading my dinosaur book"); others are long term and enduring (e.g., "I want to be a paleontologist"). Children and adolescents typically have a wide variety of goals: Being happy and healthy, doing well in school, being popular with peers, and winning athletic competitions are just a few of the many possibilities (Ford & Smith, 2007; Schutz, 1994). Here we'll look at several types of goals especially relevant to instructional settings.

Achievement Goals Early motivation theorists proposed that *achievement motivation* is a general trait that learners consistently exhibit across a wide variety of contexts. In contrast, most contemporary theorists believe that achievement motivation is somewhat specific to particular tasks, subject areas, and occasions. It can also take different forms, depending on learners' specific goals. For example, let's consider what four different boys might be thinking during the first day of a basketball unit in Mr. Wesolowski's physical education class:

> ***Jordan:*** I'd like to show everyone what a great basketball player I am. If I stay near the basket, Travis and Tony will keep passing to me, and I can make a bunch of baskets.
>
> ***Travis:*** I hope I don't screw this up. If I shoot at the basket and miss, I'll look like a real loser. Maybe I should just stay outside the three-point line and keep passing to Jordan and Tony.
>
> ***Tony:*** I really want to become a better basketball player. I'll ask Wesolowski to give me feedback about how I can improve my game. Maybe some of my friends will have suggestions as well.
>
> ***Oliver:*** I've always been a great basketball player and I always try to play my best, but I'm out of shape and worried that I won't play up to my usual standards.

All four boys want to play basketball well—that is, they all have *achievement goals.* But they have different reasons for wanting to play well. Jordan is concerned mostly about impressing his teacher and classmates and so wants to maximize opportunities to demonstrate his skills. Travis, too, is concerned about the impression he'll make, but he just wants to make sure he doesn't look *bad*. In contrast, Tony isn't thinking about how his performance will appear to others. Instead, he's interested mainly in developing his skills and doesn't expect immediate success. For Tony, making mistakes is an inevitable part of learning a new skill, not a source of embarrassment or humiliation. Oliver isn't thinking about others, but he is concerned that he won't perform as well as he thinks he should.

Jordan and Travis each have a **performance goal**, a desire to present themselves as competent in the eyes of others. More specifically, Jordan has a **performance-approach goal**: He wants to look good and receive favorable judgments from others. In contrast, Travis has a **performance-avoidance goal**: He wants to avoid looking bad and receiving unfavorable judgments. Both types of performance goals have an element of social comparison, with learners being concerned about how their accomplishments compare to those of their peers. Tony's and Oliver's approaches to basketball illustrate **mastery goals**. Tony has a **mastery-approach goal**: He wants to become a better basketball player, and he is willing to work hard to do so. In contrast, Oliver has a **mastery-avoidance goal**: He is worried that he is not going to play up to his usual standards. Neither Tony nor Oliver is concerned about how they appear to others—they both are more concerned about their own personal goals (Elliot & McGregor, 2001; Elliot et al., 2011; Régner et al., 2007; Senko et al., 2011).

These four goals aren't necessarily mutually exclusive. Learners may simultaneously hold several of these goals (Luo et al., 2011; Murayama et al., 2011; Senko et al., 2011). Returning to our basketball example, we could imagine a fifth boy, Javier, who wants to improve his basketball skills *and* look good in front of his classmates *and* not come across as a klutz, *and* who worries that he won't live up to his self-standards.

Effects of Mastery and Performance Goals In most instances, having mastery-approach goals is optimal. As Table 11.1 illustrates, learners with mastery-approach goals tend to engage in the very thoughts and behaviors that will help them learn: They pay attention in class, process information in ways that promote effective long-term memory storage, and learn from their mistakes. Furthermore, they have a healthy perspective about

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Table 11.1 Typical Differences Between Learners with Mastery versus Performance Goals

Learners with Mastery Goals (Especially Those with Mastery-Approach Goals)	**Learners with Performance Goals (Especially Those with Performance-Avoidance Goals)**
Are more likely to be actively engaged in activities and intrinsically motivated to learn material	Are more likely to be extrinsically motivated and more likely to cheat to obtain good grades
Believe that competence develops over time through practice and effort; persist in the face of difficulty	Believe that competence is a stable characteristic (people either have talent or they don't)
Choose tasks that maximize opportunities for learning; seek out challenges	Choose tasks that maximize opportunities for showing competence; avoid tasks and actions that might reveal incompetence (e.g., asking for help)
Exhibit more self-regulated learning and behavior	Exhibit less self-regulation
Use learning strategies that promote understanding and complex cognitive processes (e.g., elaboration, comprehension monitoring)	Use learning strategies that promote rote learning (e.g., word-for-word memorization); may procrastinate on assignments
Are more likely to undergo conceptual change when confronted with convincing evidence that contradicts current beliefs	Are less likely to undergo conceptual change, in part because they are less likely to notice the discrepancy between new information and existing beliefs
React to easy tasks with feelings of boredom or disappointment	React to success on easy tasks with feelings of pride or relief
Seek feedback that helps them improve	Seek feedback that flatters them
Have friends with whom they often collaborate to address academic or social problems	Collaborate with peers primarily when doing so can help them look competent or enhance their social status
Evaluate their own performance in terms of the progress they make	Evaluate their own performance in terms of how they compare with others
View errors as a normal and useful part of the learning process; use errors to improve performance	View errors as a sign of failure and incompetence; engage in self-handicapping to provide justification for errors and failures
Are satisfied with their performance if they try hard and make progress	Are satisfied with their performance only if they succeed; are apt to feel ashamed and depressed if they fail
View a teacher as a resource and guide to help them learn	View a teacher as a judge and as a rewarder or punisher
Remain relatively calm during tests and other classroom assessments	Are often quite anxious about tests and other assessments
Are more likely to be enthusiastic about and become actively involved in school activities	Are more likely to distance themselves from the school environment
Are more likely to ask for help so that they can better understand what they are learning	Are more likely to ask for help so they can get finished with academic work as quickly as possible

SOURCES: Ablard & Lipschultz, 1998; Anderman & Anderman, 2009; Anderman & Maehr, 1994; Corpus et al., 2009; Dweck, 1986; Dweck et al., 2004; Elliot et al., 2011; Gabriele, 2007; Graham & Weiner, 1996; Hardré et al., 2007; Kaplan & Midgley, 1999; Lau & Nie, 2008; Levy-Tossman et al., 2007; Liem et al., 2008; Linnenbrink & Pintrich, 2002, 2003; McGregor & Elliot, 2002; Middleton & Midgley, 1997; Murphy & Alexander, 2000; Nolen, 1996; Pekrun, 2006; Poortvliet & Darnon, 2010; Pugh & Bergin, 2006; Rawsthorne & Elliot, 1999; Ryan & Shim, 2012; Senko et al., 2011; Shim et al., 2008; Sideridis, 2005; Sins et al., 2008; Skaalvik, 1997; Steuer & Dresel, 2011; Turner et al., 1998; Urdan, 2004; Urdan et al., 1998; Urdan & Kaplan, 2020; Wolters, 2004.

learning, effort, and failure: They realize that learning is a process of trying hard and continuing to persevere in the face of temporary setbacks. Consequently, these learners are the ones who are most likely to persist with tasks. Mastery-approach goals also seem to help students to respond to unfavorable social comparisons in effective ways (Chatzisarantis et al., 2016). Mastery-approach goals are related positively to academic success, and the benefits of mastery-approach goals seem to be consistent across numerous cultures (King et al., 2017). Mastery-approach goals are related to achievement, although some null results have been reported. Mastery-approach goals are particularly beneficial when they are experienced along with autonomy support (discussed in Chapter 10) (Benita et al., 2014; Elliot et al., 2011; Keys et al., 2012; Kumar et al. 2002; Sins et al., 2008). Research on mastery-avoidance goals has been limited, but the limited research suggests that mastery-avoidance goals are related to maladaptive outcomes, such as increased anxiety and fear of failure (Sideridis, 2008).

In contrast, learners with performance goals—especially those with performance-*avoidance* goals—tend to avoid challenges, give up easily in the face of failure, and are apt to engage in self-handicapping when they expect to do poorly.

Performance-*approach* goals are a mixed bag: They sometimes have positive effects, especially in combination with mastery-approach goals, spurring learners to achieve at high levels (Linnenbrink, 2005; Rawsthorne & Elliot, 1999; Wolters, 2004). Yet by themselves, performance-approach goals may be less beneficial than mastery-approach goals: Learners may exert only the minimum effort necessary, use relatively superficial learning strategies (e.g., rote memorization), and sometimes cheat on assessments. Performance-approach goals appear to be most detrimental when learners are younger (e.g., in the elementary grades), and have low self-efficacy for classroom tasks (Anderman et al., 1998; Midgley et al., 2001; Wang & Holcombe, 2010). Performance goals are salient in students' minds when teachers spend much time emphasizing the importance of grades; this is particularly problematic when performance-avoidance goals are induced (Pulfrey et al., 2011).

Developmental Trends in Achievement Goals In the preschool and early elementary years, children seem to focus mostly on mastery-approach goals, but performance goals become increasingly prevalent at more advanced grade levels (Bong, 2009; Dweck & Elliott, 1983; Harter, 1992). By the time students reach high school, they may find pleasure in learning new things, but many are concerned primarily with getting good grades and prefer short, easy tasks to lengthier, more challenging ones. Performance goals are also common in team sports, where the focus often is more on winning and gaining public recognition than on developing skills (Roberts et al., 1997).

When children begin school at age 5 or 6, two things happen that gradually orient them more toward performance goals (Dweck & Elliott, 1983). First, they now have many peers with whom to compare their own learning, and they may sometimes see themselves coming up short. Second, children may have trouble evaluating their progress on complex academic skills and thus must rely on others (e.g., teachers) to make judgments about their competence. As children reach adolescence, two more factors kick in: They become increasingly concerned about what other people think of them, and they realize that performing at high levels—for instance, getting good grades—is critical for their future educational and professional opportunities (Anderman & Mueller, 2010; Covington & Müeller, 2001; Juvonen, 2000; Midgley, 1993).

Adolescents' increasing concern about other people's opinions of them may remind you of the *imaginary audience*, a concept presented in Chapter 3.

Many teaching and coaching practices also contribute to the development of performance goals. Consider these common practices:

- Praising students only for correct answers
- Posting only the "best" work on a bulletin board or a class website
- Grading tests on a curve
- Constantly reminding students of the importance of good grades for college admissions
- Giving special recognition to sports teams that consistently defeat their rivals

All of these strategies are undoubtedly well intentioned, but they encourage students to focus their attention more on *demonstrating* competence than on *acquiring* it (Anderman & Mueller, 2010; Midgley, 2002).

Fostering Productive Achievement Goals To some degree, performance goals (both performance-approach and avoidance) are probably inevitable in today's schools and in society at large. Learners may quite legitimately use their peers' performance as a criterion for evaluating their own ability, many colleges look at grade point averages and test scores when screening applicants, and many aspects of the adult world are inherently competitive. Ultimately, however, mastery-approach goals are the ones that are most likely to lead to effective learning and performance.

Sometimes mastery-approach goals come from within, especially when students both value and have high self-efficacy for learning a topic (Liem et al., 2008;

Pajares, 2009). But the following classroom practices can also encourage mastery-approach goals:

- Show how mastery of certain topics is relevant to students' long-term personal and professional goals.
- Require that students *understand*, rather than simply memorize, classroom material.
- Communicate the belief that effective learning requires exerting effort and making mistakes (and don't penalize students for taking risks and making mistakes!). Nevertheless, you should be careful about assuming that students are not exerting effort. Particularly for adolescents, those who exert a lot of effort and still don't succeed may interpret this as a signal that you think they are "dumb" (Amemiya & Wang, 2018). It may be more helpful to suggest alternative strategies that will help them be effective.
- Give students, and ask students to set, short-term, concrete goals—known as **proximal goals**—toward which to work; identify goals that are challenging yet accomplishable with reasonable effort.
- Provide regular feedback that enables students to assess their progress toward goals. Offer specific suggestions about how students can improve.
- Give praise that focuses on content rather than on comparison with classmates.
- Encourage students to use their peers not as reference points for their own progress but rather as a source of ideas and assistance. (Anderman & Maehr, 1994; Brophy, 2004; Corpus et al., 2004; Locke & Latham, 2006; Middleton & Midgley, 2002; Miller & Brickman, 2004; Page-Voth & Graham, 1999; Perry & Winne, 2004; Schunk & Pajares, 2005; Turner et al., 1998; Urdan et al., 2002; Wang & Holcombe, 2010)

Work-Avoidance Goals As we've seen, learners sometimes want to avoid looking bad. But on other occasions they may want to avoid doing classroom tasks *at all*, or at least to invest as little effort as possible. In other words, learners may have a **work-avoidance goal**, often because they have low self-efficacy for the tasks at hand (Coddington & Guthrie, 2008; Dowson & McInerney, 2001; Urdan et al., 2002). Students use a variety of strategies to avoid doing their work—for instance, they might engage in disruptive behaviors or refuse to contribute to small-group activities (Dowson & McInerney, 2001; Gallini, 2000; Hemmings, 2004). Work-avoidance goals are related to poor cognitive engagement, low grades, and negative affect (King & McInerney, 2014).

Use multiple strategies—including extrinsic reinforcement if necessary—to engage students who have work-avoidance and doing-just-enough goals.

Social Goals In Chapter 10, we noted that people have a need for relatedness—to feel socially connected with others. Consistent with this need, children and adolescents are apt to have a variety of social goals. Such goals typically include some or all of the following:

- Forming and maintaining friendly or intimate social relationships
- Gaining other people's approval
- Establishing a balance between "fitting in" and "standing out" among one's peers
- Achieving status, popularity, and prestige among peers
- Becoming part of a cohesive, mutually supportive group; gaining a sense of belonging in the classroom
- Adhering to the rules and conventions of the group (e.g., being a good "class citizen")
- Meeting social obligations and keeping interpersonal commitments
- Assisting and supporting others and ensuring their welfare (Dowson & McInerney, 2001; Ford & Smith, 2007; Gray, 2014; Hinkley et al., 2001; Kiefer & Ellerbrock, 2011; Patrick et al., 2002; Schutz, 1994; Wentzel et al., 2007)

The specific nature of students' social goals affects their behavior and academic — performance—sometimes for the better but sometimes for the worse. If students are seeking friendly relationships with classmates or are concerned about others' welfare, they may eagerly engage in such activities as cooperative learning and peer tutoring (Dowson & McInerney, 2001; Wentzel et al., 2007). But if they're more concerned about gaining the *approval* of their peers, they may go out of their way to behave in ways they think will please others, possibly compromising their own standards for behavior in the process and possibly also alienating peers because they're trying too hard to be liked (Bartlett et al., 2007; Boyatzis, 1973; Rudolph et al., 2005).

Many students are also eager to form productive social relationships with their teachers. Ideally, we would hope that they see teachers primarily as sources of support and guidance. But some may be more concerned with gaining our approval, in which case they're likely to shoot for performance goals and may self-handicap in activities at which they expect to do poorly (Davis, 2003; Hinkley et al., 2001; Rose & Thornburg, 1984).

Long-Term Life Goals Many children and adolescents give considerable thought to the kinds of lives they want to lead and set goals consistent with those hoped-for lives (Lee et al., 2010; Mouratidis et al., 2013; Oyserman, 2008). Key among these long-term goals, of course, are career goals. Young children set such goals with little thought and change them frequently; for instance, a 6-year-old may want to be a firefighter one week and a professional baseball player the next. But by late adolescence, many young people have reached tentative and relatively stable decisions about the career paths they want to pursue (Lapan et al., 2003; Marcia, 1980). Often, their choices are based on a strong sense of competence in a particular domain and on personal and cultural values regarding important life pursuits (Plante & O'Keefe, 2010). Some adolescents also think about broader long-term goals, such as how one can have a positive impact on the world; when students consider both their career goals and such broader goals, they are likely to feel a greater sense of purpose and meaning in their lives (Yeager et al., 2012).

Students' long-term goals can direct them toward particular curricular and extracurricular activities—perhaps in science, music, or athletics. Three teaching strategies can capitalize on those goals:

- Have students brainstorm the kinds of knowledge and abilities they're likely to need to accomplish their goals, and how they might obtain and master such knowledge.
- Have students brainstorm possible obstacles they might encounter in pursuit of their goals, along with specific ways they might overcome those obstacles.
- Regularly tie what you are teaching to students' goals; for example, conduct activities in which they can authentically apply content to tasks related to their chosen professions. (Gay, 2010; Nolen, 2011; Oyserman, 2008)

Many children begin thinking about long-term goals as early as the preschool and early elementary years.

But in addition, we must keep in mind that many students don't have the self-regulation skills to keep themselves on track toward meeting their long-term goals, perhaps because they have few self-regulating role models in their lives (Miller & Brickman, 2004; Oyserman, 2008; Wilson & Corbett, 2001). Another key strategy, then, is to teach and scaffold such skills—scheduling sufficient time for studying, saying "no" to appealing but nonproductive leisure-time activities, and so on. At the same time, students will probably persist in pursuing their goals if they also build enjoyable leisure activities into their schedules. Expecting them to totally deny themselves life's little pleasures isn't likely to be either productive or realistic (M. Hofer, 2010).

Coordinating Multiple Goals Most students have numerous goals and use a variety of strategies to juggle them (Conley, 2012; Covington, 2000; Darnon et al., 2010; Dodge et al., 1989; Kim et al., 2021; Urdan & Maehr, 1995). Sometimes students find activities that allow them to address two or more goals simultaneously; for example, they can address both achievement goals and social goals by forming a study group to prepare for a test. Sometimes students pursue one goal while temporarily putting others on the

Urge students to build enjoyable leisure activities into their daily schedules, perhaps by making those activities contingent on completing specific academic tasks.

back burner; for example, they might complete a required reading assignment while bypassing more interesting but unassigned material. And occasionally, students may modify their idea of what it means to achieve a particular goal; for instance, an ambitious high school student who initially hopes to earn all As in three advanced classes may eventually concede that earning Bs in two of them may be more realistic.

In other situations, students may entirely abandon one goal in order to satisfy another, conflicting one (Hofer, 2010; McCaslin & Good, 1996; Phelan et al., 1994). For example, students who want to do well in school may choose *not* to perform at their best in order to maintain relationships with peers who don't value academic achievement (Brown, 1993; Ogbu, 2008b). And students with mastery-approach goals in particular content domains may find that the multiple demands of school force them into focusing on performance goals (e.g., getting good grades) rather than studying the subject matter as thoroughly as they'd like.

Finally, we must recognize that our students also often pursue multiple goals during specific lessons, or while working on specific tasks (Kim et al., 2021). For example, while working in small groups on a science project, a student might simultaneously hold academic goals (e.g., getting a good grade on the science project) and social goals (e.g., getting along with the other members of the group). Older students in particular, who are more able to self-regulate and control their emotions, might also hold well-being goals (e.g., managing feelings of frustration with other group members who may not be pulling their weight). As classroom teachers, we need to be aware that our students hold multiple goals while working on various assignments. When we observe students struggling to manage these multiple goals, we can gently intervene to offer advice on how to prioritize and manage those goals.

Consider how your classroom practices might help students address multiple goals simultaneously.

Mindsets

As children and adolescents develop and have more experiences of successes and failures in school, they develop beliefs about their abilities and their own personal intelligence. These beliefs can affect the types of goals that students pursue. Some of our students may believe that they can succeed at a difficult task or achieve a challenging goal, because they believe that their brains have the ability to acquire new information and skills; but other students may feel that their intelligence is fixed at a particular level, and that they just may not have the ability to learn certain topics well (or more generally, just to learn!). Let's explore what this might feel like with a brief exercise.

Experiencing Firsthand

Exploring Mindsets

Think about an area in your life in which you have been very successful (e.g., playing tennis; learning a foreign language; playing a musical instrument). Write down what you think about your potential to learn more about this area and to develop new, complex skills in this area. Now think about an area in your life in which you feel that you have no talent at all (e.g., perhaps as a writer, a baker, or a track and field star). Write down what you think about your potential to learn more about this topic and to develop your skill sets in this area.

Now take a look at your responses. You probably wrote that you feel that you do have the potential to learn more in the area in which you have previously experienced success. When we believe that our ability to learn something is possible and that our potential to improve our skills is high, we have what is known as a **"growth" mindset**. This means that we genuinely believe that we can learn, grow, and excel in this area—that our brains are capable of mastering new topics and skills—and that practice will lead to improvements in learning.

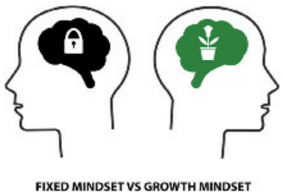
In addition, you might have written something about your lack of confidence in your ability to excel in the area in which you believe that you lack talent. When we believe that our ability to learn something is limited, we have what is known as a **"fixed" mindset**. This means that we believe that we simply do not have the capacity to excel in a particular academic area and that our intelligence can't improve, even with practice. It means we believe that our brains are just not capable of learning in certain areas, as Sarah reveals in her description of her problems in math:

> My dad is very good at math, and my brother, I, and my mom aren't good at math at all, we inherited the "not good at math gene" from my mom and I am good in English but I am not good in math. (Ryan et al. 2007, p. 57)

Students with a growth mindset are likely to adopt mastery-approach goals, to work hard at their studies, and to earn high grades and standardized test scores. In contrast, students with a fixed mindset often adopt performance goals, quickly lose interest in a topic that doesn't come easily to them, self-handicap in the face of failure, and earn lower grades over time (Blackwell et al., 2007; Chen & Pajares, 2010; Dweck & Leggett, 1988; Dweck & Molden, 2005; Good et al., 2003; Yeager et al., 2019).

Some of our students may have a *generalized* growth **mindset**, meaning that they believe that they can probably learn anything if they work hard. It is important to remember that although some of our students may have a general growth mindset, they still may not want to learn about topics that they are not interested in or do not value. In other cases, our students may hold a growth mindset in only certain domains (e.g., a student might have a growth mindset in mathematics but not in reading).

This also holds true for fixed mindsets. We need to be particularly cognizant of students who hold a generalized fixed mindset. If a student believes that no matter what, she simply is not a good learner (e.g., because she just does not have a "smart brain"), that belief may have a detrimental impact on motivation and achievement across all academic areas.


FIXED MINDSET VS GROWTH MINDSET

Busyok Creative/Shutterstock

Students who hold a growth mindset believe that they can learn new material, even if it's challenging; students who hold a fixed mindset believe that there are some things they'll just never be able to learn.

Chapter 5 presents varying perspectives on the origins of intelligence.

Fortunately, there are some strategies that teachers can use to facilitate the development of a growth mindset in their students:

- Set short-term, easy-to-reach goals (proximal goals), so that students experience success even in areas that they find challenging. This will increase their self-efficacy and encourage a growth mindset.
- Tell your students a bit about how the brain works. Help them to understand that when *anything* is learned, new connections are made, and that this happens for everyone; thus, everyone has the potential to learn.
- Teach students that intelligence is in fact malleable—we can often dispel beliefs about the fixed nature of intelligence by simply making students aware of the benefits of a growth mindset.
- Avoid using performance-oriented instructional practices (e.g., encouraging your students to publicly demonstrate how much they have learned) (Park et al., 2016).
- Avoid grouping students by ability whenever possible. When we use ability grouping, we are sending a message to our students about our beliefs about their capabilities. A student who is always in the low-level reading group is likely to develop a fixed mindset toward reading. Alternatives include allowing students to choose groups based on interests or changing the basis for forming groups regularly, rather than assigning groups solely based on ability.

Portray intelligence and domain-specific abilities as characteristics that can change with effort and persistence.

Learned Helplessness As children grow older, they gradually develop predictable expectations for their future performance. Consider these two students, keeping in mind that *their actual ability level is the same.*

- Jared is an enthusiastic, energetic learner. He works hard at school activities and takes pleasure in doing well. He likes challenges, especially the brainteaser problems his teacher assigns as extra-credit work each day. He can't always solve the problems, but he takes failure in stride and is eager for more problems the next day.

- Jack is an anxious student who doesn't have much confidence in his ability to do his schoolwork. In fact, he often underestimates what he can do: Even when he has succeeded, he doubts that he can do it again. He prefers filling out drill-and-practice worksheets to practice skills he's already mastered, rather than attempting new tasks and problems. As for those daily brainteasers Jared likes so much, Jack sometimes takes a stab at them but gives up quickly if the answer isn't obvious.

Over time, some learners, like Jared, develop an "I can do it" attitude—a general sense of optimism that they can master new tasks and succeed in a variety of endeavors. Other learners, like Jack, develop an "I *can't* do it" attitude, also known as **learned helplessness**—a general sense of futility about their chances for future success. You might think of this distinction, which really reflects a continuum rather than an either–or dichotomy, as a difference between *optimists* and *pessimists* (Boman et al., 2009; Peterson, 1990, 2006; Seligman, 1991).

Students like Jared behave in ways that lead to higher achievement. They set ambitious goals, seek challenging situations, have a growth mindset, and persist in the face of failure. In contrast, students who underestimate their ability, like Jack, may develop feelings of learned helplessness; these students often set goals they can easily accomplish, avoid the challenges likely to maximize their learning and cognitive growth, have a fixed mindset, and respond to failure in counterproductive ways (e.g., giving up quickly) that almost guarantee future failure (Dweck, 2000; Graham, 1989; Lopez et al., 2009; Peterson, 2006; Seligman, 1991).

By age 5 or 6, some children begin to show a consistent tendency either to persist at a task and express confidence, or to abandon a task quickly and say they don't have the ability to do it (Burhans & Dweck, 1995; Ziegert et al., 2001). However, children younger than 8 rarely exhibit extreme forms of learned helplessness, perhaps because they still believe that success is due largely to their own efforts (Eccles et al., 1998; Lockhart et al., 2002; Paris & Cunningham, 1996). By early adolescence, a general sense of helplessness becomes more common. Some middle schoolers believe they can't control the things that happen to them and are at a loss for strategies about how to avert future failures (Dweck, 2000; Paris & Cunningham, 1996; Peterson et al., 1993).

When working with students who have learned helplessness, be consistent and persistent in your efforts to help them succeed.

Strategies we've previously identified for enhancing self-efficacy, growth mindsets, and a sense of competence (e.g., monitoring success on short-term goals) should promote mastery goals as well. In addition, students should know that they have a variety of resources—their teachers, their peers, software, volunteer tutors—to which they can turn in times of difficulty. In general, students must have sufficient academic support to believe "I can do this if I really want to."

Why Did I Succeed (or Not Succeed) at a Task?

Learning Objective 11.2 Explain how learners' beliefs about why they did or did not succeed at various tasks impacts their motivation and learning.

Attributions are learners' self-constructed explanations of their successes and failures—their beliefs about *what causes what* in their personal lives. Learners are often eager to identify the probable causes of things that happen to them, especially when events are unexpected—for instance, when they get a low score on a class assignment after thinking they've done a good job (Graham, 2020; Graham & Taylor, 2022; Stupnisky et al., 2011; Tollefson, 2000; Weiner, 1986, 2000).

All of us form attributions for many events in our daily lives—about why we do well or poorly in school, why we're popular or unpopular with peers, why we're skilled athletes or total klutzes, and so on. To gain insight into the kinds of attributions you yourself might form, try the following exercises.

Experiencing Firsthand

Exercise 1: First Date

Imagine that you ask someone whom you are fond of to go out on a date. You have a good time and decide to call the next day to chat. Although you expect the call to go well, your "date" speaks awkwardly, and ends the conversation abruptly.

Why do you think this happened? Jot down a few reasons why your date might not want to go out again.

Here are some possible reasons that you might have considered:

- My date thought I was unattractive.
- My date didn't like my personality.
- I must have said something stupid.
- The restaurant was too noisy and that ruined the date.
- My date was a jerk; I'm moving on.

Your beliefs about why the date did not go well might have an impact on your subsequent feelings about asking someone else out on a date in the future. If you think that your date doesn't want to go out with you again because you have a dull personality, then you might be reluctant to ask someone else out; but if you believe it was because the restaurant was too noisy, then you might feel ready to ask someone else out right away. Now let's look at how this might play out in classrooms.

Exercise 2: Carberry and Seville #1

1. Professor Josiah S. Carberry has just returned the first set of exams in your advanced psychoceramics class. You've gotten one of the few high test scores in the class: an A–. Why did you do so well when most of your classmates did poorly? Jot down several possible explanations for your high grade in Carberry's class.
2. An hour later, you get the results of the first test in Professor Barbara F. Seville's sociocosmetology class, and you learn that you *failed* it! Why did you do so poorly? Jot down several possible reasons for your F on Seville's test.
3. You'll be taking second exams in both psychoceramics and sociocosmetology in about three weeks. How much will you study for each exam?

Here are some possible explanations for your A– in Carberry's class:

- You studied hard.
- You're a very intelligent human being.
- You have a natural talent for psychoceramics in particular.
- You were lucky that Carberry chose questions you could answer correctly.
- All those hours you spent flattering Carberry in his office, asking questions about psychoceramics and requesting copies of the articles he's written (which you never actually read), really paid off.

In contrast, here are some possible reasons you failed the exam in Seville's class:

- You didn't study enough.
- You studied the wrong things.
- You've never had a knack for sociocosmetology.
- The student next to you was constantly distracting you with his wheezing and coughing.
- You were unlucky. If Seville had asked different questions, you'd have done better.
- It was a bad test: The questions were ambiguous and tested knowledge of trivial facts.

How much time you spend studying for the next exams will depend to some degree on how you've interpreted your previous test grades. Let's first consider your A– on Professor Carberry's exam. If you think you did well because you studied hard, you'll probably spend a lot of time studying for the second test as well. If you think you did well because you're smart or a natural whiz at psychoceramics, you may not study quite as much. If you believe your success was a matter of luck, you may hardly study at all, but you might wear your lucky sweater when you take the next exam. And if you think the A– reflects how much Carberry likes you, you may decide that time spent flattering him is more important than time spent studying.

Now let's consider your failing grade on Professor Seville's exam. Once again, your explanation of the grade will influence the ways in which you prepare for the second exam—if, in fact, you prepare at all. If you believe you didn't study enough or didn't study the right things, you may spend more time studying. If you think your poor grade was due to a temporary situation—the student sitting next to you was distracting—you may study in much the same way you did before, hoping you'll do better next time. If you believe your failure was due to your low aptitude for sociocosmetology or to the fact that Seville writes lousy tests, you may study even less than you did the first time. What good will it do to study when your poor test performance is beyond your control?

Attributions vary in three primary ways (Weiner, 1986, 2000, 2004, 2005):

- *Locus: Internal versus external.*[1] Learners sometimes attribute the causes of events to *internal* things—to factors within themselves. Thinking that a good grade is due to your hard work and believing that a poor grade is due to your lack of ability are examples of internal attributions. At other times, learners attribute events to *external* things—to factors outside themselves. Concluding that you received a scholarship because you were lucky is an example of an external attribution.
- *Stability: Stable versus unstable.* Sometimes learners believe that events are due to *stable* factors—to things that probably won't change much in the near future. For example, if you believe that you do well in science because of your innate intelligence or that you have trouble making friends because you're unattractive, you're attributing events to stable, relatively long-term causes. But sometimes learners believe that events result from *unstable* factors—things that can change from one time to the next. Thinking that you won a tennis game because your opponent wasn't feeling well and believing you got a bad test grade because you were exhausted when you took the test are examples of attributions involving unstable factors.
- *Controllability: Controllable versus uncontrollable.* On some occasions, learners attribute events to *controllable* factors—internal things they can influence and change. For example, if you think a classmate invited you to a party because you often smile at him and if you think you failed a test because you didn't study the right things, you're attributing these events to controllable factors. On other occasions learners attribute events to *uncontrollable* factors—to things over which they have no influence. If you think that you were chosen for the lead in the school play only because you look "right" for the part or that you played a lousy game of basketball because you were sick, you're attributing these events to uncontrollable factors.

In general, learners tend to attribute their successes to internal causes (e.g., high ability, hard work) and their failures to external causes (e.g., luck, other people's actions) (Mezulis et al., 2004; Rhodewalt & Vohs, 2005). By patting themselves on the back for things they do well and putting the blame elsewhere for poor performance, they can maintain their sense of self-worth. But when learners *consistently* fail at tasks—especially when they see their peers succeeding at the same tasks—they're apt to put the blame on a stable and uncontrollable internal factor: their own low ability (Covington, 1987; Graham, 2020; Hong et al., 1995; Schunk, 1990; Weiner, 1984).

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[1] This dimension is sometimes referred to as *locus of control;* however, as you can see in the discussion here, *locus* and *control* are two distinct dimensions (Weiner, 1986, 2000).

You can enhance intrinsic motivation in your students by shaping their attributions through the feedback that you provide to them.

How Attributions Influence Emotion, Cognition, and Behavior Attributions influence a number of factors that either directly or indirectly affect students' motivation. First, attributions influence learners' *emotional reactions to success and failure.* Learners are apt to feel proud about their successes and guilty and ashamed about their failures only if they attribute these outcomes to internal causes—for instance, to things they themselves have done or personal characteristics. As unpleasant as guilt and shame might feel, such emotions often spur learners to address their shortcomings. If, instead, learners think someone else was to blame for an undesirable outcome, they're apt to be angry—an emotion that may not lead to productive follow-up behaviors (Hareli & Weiner, 2002; Pekrun, 2006).

Second, attributions have an impact on *expectations for future success and failure.* When learners attribute their successes and failures to stable factors—perhaps to innate ability—they expect their future performance to be similar to their current performance. In contrast, when they attribute successes and failures to *un*stable factors—for instance, to effort or luck—their current success rate has little influence on future expectations. The most optimistic learners—those with the highest expectations for future success—are the ones who attribute their successes to stable, dependable (and usually internal) factors, such as an enduring work ethic, and attribute their failures to unstable factors, such as lack of effort or inappropriate strategies (Dweck, 2000; Lopez et al., 2009; McClure et al., 2011; Pomerantz & Saxon, 2001).

Third, attributions affect *effort and persistence.* Learners who believe their failures result from their own lack of effort (which is controllable) are apt to try harder and persist in the face of difficulty. Learners who, instead, attribute failure to a lack of innate ability (an uncontrollable cause) give up easily and sometimes can't even perform tasks well that they've previously done successfully (Dweck, 2000; Feather, 1982; McClure et al., 2011; Weiner, 1984).

Fourth, attributions influence *learning strategies and academic performance.* Learners who expect to succeed in the classroom and believe that academic success is a result of their own actions are more likely to apply effective learning and self-regulatory strategies, especially when they're *taught* these strategies. In contrast, learners who expect failure and believe that their academic performance is largely out of their hands often reject effective learning strategies in favor of rote-learning approaches (Mangels, 2004; Palmer & Goetz, 1988; Zimmerman, 1998). It shouldn't surprise you to learn that students with internal, controllable attributions for academic success are more likely to achieve at high levels and graduate from high school (Davis et al., 2002; Dweck et al., 2004; McClure et al., 2011; Pintrich, 2003).

Finally, attributions also are affected by various environmental cues. When an academic task appears to be complex and exceptionally challenging—and especially if classmates are struggling with it as well—failure can easily be attributed to task difficulty rather than to internal causes. But if peers are performing a task with ease, learners are likely to attribute their own failures to low ability (Schunk, 1990; Weiner, 1984).

Let's consider how some of the factors just discussed play out in the opening case study. Elias initially is excited about learning Spanish. However, after he experiences challenges during the first two weeks of school in learning his Spanish numbers, his excitement diminishes. Recall that while eating dinner near the end of the second week of school, Elias told his parents, "I'm just not good at learning new languages." He then went on to say, "I'm not smart enough to learn this stuff." Elias is attributing his difficulties in learning the numbers in Spanish to ability (or, more specifically, to a perceived lack of ability). Although Elias initially thought he could succeed at learning a new language, his lack of success during the first two weeks of school led him to attribute his difficulties to a lack of ability. Elias probably sees his ability to learn a foreign language as uncontrollable, stable, and internal—and consequently, he is unlikely to feel that he can overcome these difficulties and succeed in Spanish class.

But now, let's imagine a slightly different take on Elias's story. Suppose that after a few days, Señora Martin noticed that Elias was having difficulty learning the numbers. Instead of having her students focus on learning *all of the numbers* up to 20 in two weeks, Señora Martin might have re-thought her lesson plans, and instead asked them to focus on learning three numbers per night. If she had asked her students to focus on short-term goals, rather than on the long-term goal of learning all the numbers through 20, Elias might have experienced daily success and felt better about learning Spanish. And in terms of his attributions, if he successfully learned three numbers per night, he might attribute his success to his effort.

Developmental Trends in Attributions Young children become increasingly able to distinguish among the various possible causes of their successes and failures, including effort, ability, luck, and task difficulty (Dweck & Elliott, 1983; Eccles et al., 1998; Nicholls, 1990). One distinction they come to understand is that between effort and ability. Very young children often think of effort and ability as positively correlated: People who try harder are more competent. Thus, they tend to attribute their successes to hard work and are usually optimistic about their chances for future success as long as they try hard. Recent research suggests that as early as age 4, they begin to understand that effort and ability often compensate for each other and that people with less ability may need to exert greater effort (Muradoglu & Cimpian, 2020). Many eventually begin to attribute their successes and failures to an inherited ability—for instance, intelligence—which they perceive to be fairly stable and beyond their control. If they're usually successful at school tasks, they have high self-efficacy for the tasks, but if they often fail, their self-efficacy is likely to plummet (Dweck, 1986; Eccles [Parsons] et al., 1983; Schunk, 1990). The following exercise demonstrates how students' beliefs about their abilities change as they move through elementary school.

Experiencing Firsthand

How Do I Compare?

Imagine presenting a picture of 30 circles on a piece of paper, where the circles are equally spaced starting at the top of the sheet and going to the bottom. Now imagine asking the following question to a student: *"These circles represent all of the students in your class. The top circle is the best reader, and the bottom circle is the worst reader in the class. Which circle represents you?"* How do you think a first grader would respond? A fifth grader?

Most often, the first graders will put themselves at or near the top of the page, regardless of ability, whereas the fifth graders usually will think about the question and place themselves fairly accurately along the continuum (Nicholls, 1978).

Diversity in Cognitive and Sociocultural Factors Affecting Motivation

In the preceding sections and in Chapter 10, we've discussed individual differences in personal interests, values, achievement goals, and general attributional style. Here our focus will be on diversity in students of various cultural and ethnic backgrounds, genders, and income levels, as well as in students with special educational needs. Table 11.2 summarizes developmental trends in attributions and other aspects of motivation.

Cultural and Ethnic Differences Most cultural and ethnic groups place high value on getting a good education (Cook & Ludwig, 2008; Fuligni & Hardway, 2004; Phalet et al., 2004; Spera, 2005), but researchers have observed differences in more specific values

DEVELOPMENTAL TRENDS

Table 11.2 Motivation at Different Grade Levels

Grade Level	Age-Typical Characteristics	Example	Suggested Strategies
K–2	• Focus more on acquiring competence than on self-evaluating • Rapidly changing interests for many students • Pursuit of interesting and enjoyable activities regardless of expectancy for success • Tendency to attribute success to hard work and practice, leading to optimism about what can be accomplished	Six-year-old Jacob currently loves learning about cats. He draws cats during his free time, and when he goes to the school library, he looks for books about cats. One day, with his teacher's permission, his parents bring his pet cat to class and Jacob explains the things he must do to take care of it.	• Engage students' interest in topics through hands-on, play-like activities. • Entice students into reading, writing, and other basic skills through high-interest books and subject matter (e.g., animals, superheroes). • Show students how they're improving over time; point out how their effort and practice are contributing to their improvement.
3–5	• Increasing tendency to self-evaluate, in part by observing how one's own performance compares to that of peers • Emergence of fairly stable interests • Increasing focus on performance goals • Increasing belief in innate ability as a significant and uncontrollable factor	During a gymnastics unit, 9-year-old Marta watches her classmates as they perform forward and backward rolls, handstands, and cartwheels. She willingly executes the rolls, but when she has trouble getting her legs up for a handstand, she quickly gives up, saying, "I can't do handstands and cartwheels—not like Jessie can."	• Allow students to pursue personal interests. • Encourage students to judge their performance based on their own improvement, rather than on how it compares with that of peers. • Demonstrate your own enthusiasm about topics; communicate reasons why many topics are worth learning about for their own sake. • Identify strengths in every student; provide sufficient support to enable students to gain proficiency in areas of weakness. • Be aware of your own biases when evaluating your students. Sometimes stereotypical beliefs that we hold can affect our interactions with our students.
6–8	• Decline in general sense of competence (relative to peers) in many subjects • Increasing tendency to self-handicap as a way of maintaining self-worth during difficult tasks • Increasing interest in activities that are stereotypically "gender appropriate" • Increasing tendency to value activities associated with long-term goals and high expectancies for success • For many, decline in perceived value of some content domains (e.g., English, math, music, sports) • Increasing focus on social goals (e.g., interacting with peers)	Thirteen-year-old Regina has always liked math. But now that she's in an advanced eighth-grade math class, she's starting to worry that her peers might think she's a "math geek." She diligently does her math homework each night and earns high grades, but she rarely raises her hand to ask or answer questions. When her friends ask her about the class, she rolls her eyes and says that she's in the class only because "Dad made me take it."	• Promote interest in topics by presenting puzzling phenomena and building on students' personal interests. • Focus students' attention on their improvement; minimize opportunities for them to compare their performance to that of classmates. • Relate subject matter to students' long-term goals (e.g., through authentic activities). • Provide opportunities for social interaction as students study and learn (e.g., through role-playing activities, debates).
9–12	• Increasing integration of certain interests and values into one's overall sense of self • Increased prevalence of performance goals (e.g., getting good grades) rather than mastery goals • Increase in cheating • Increasing focus on postgraduation goals (e.g., college, careers); for some students, insufficient self-regulatory strategies to achieve these goals	Randall, who is 16, wants to become a pediatric oncologist—as he puts it, "a cancer doctor who can help kids with leukemia, like my sister had." He knows he needs good grades in order to get into a prestigious college and then medical school, yet he has trouble saying no when his friends ask him to go to a basketball game the night before an important biology test. And when he gets home after the game, he spends an hour on Snapchat instead of studying.	• Provide opportunities to address interests and values through out-of-class projects and extracurricular activities. • Make it possible for students to attain good grades through reasonable effort and effective strategies; minimize competitive grading practices, such as grading on a curve. • Discourage cheating (e.g., by giving individualized assignments and monitoring behavior during in-class assessments), and impose appropriate consequences when cheating occurs. • Teach self-regulation strategies that can help students reach their long-term goals.

SOURCES: Alexander et al., 2008; Archambault et al., 2010; Blumenfeld et al., 2006; Bong, 2009; Bonneville-Roussy et al., 2019; Brophy, 2008; Cizek, 2003; Corpus et al., 2009; Dijkstra et al., 2008; Dotterer et al., 2009; Eccles et al., 1998; Garcia et al., 2019; Hidi et al., 2004; Jacobs et al., 2005; Jacobs et al., 2002; Juvonen, 2000; LaFontana & Cillessen, 2010; Lepper et al., 2005; Nolen, 2007; Patrick et al., 2002; Shute, 2008; Urdan, 2004; Wigfield, 1994; Wigfield et al., 2006; Wigfield et al., 1991; Wilson & Corbett, 2001; Wolters, 2003; Youniss & Yates, 1999.

related to school learning. For example, many Asian cultures (e.g., in China and Japan) emphasize learning for learning's sake: With knowledge comes personal growth, better understanding of the world, and greater potential to contribute to society. Important for these cultures, too, are hard work and persistence in academic studies, even when the content isn't intrinsically enjoyable (Hufton et al., 2002; Li, 2006; Morelli & Rothbaum, 2007). Students from European American backgrounds are less likely to be diligent when classroom topics have little intrinsic appeal, but they often find value in academic subject matter that piques their curiosity and in assignments that require creativity, independent thinking, or critical analysis (Hess & Azuma, 1991; Kuhn & Park, 2005; Nisbett, 2009).

Learners from diverse backgrounds may define academic success differently and, as a result, may set different achievement goals. For example, on average, Asian American students aim for higher grades than do students from other ethnic groups, in part to win their parents' approval and in part to bring honor to their families (Nisbett, 2009; Steinberg, 1996). Even so, many Asian American students—and African American students as well—tend to focus more on mastery-approach goals (i.e., truly understanding what they're studying) than European American students do (Freeman et al., 2002; Qian & Pan, 2002; Shim & Ryan, 2006). Moreover, students brought up in cultures that value group achievement over individual achievement (e.g., many Asian, Native American, Mexican American, and Pacific Island cultures) tend to focus their mastery-approach goals not on how much they alone can improve but instead on how much they *and their peers* can improve—or in some instances on how much their individual actions can contribute to the betterment of the larger social group or society (Chiu & Hong, 2005; Kağitçibaşi, 2007; Li, 2005, 2006).

Learners' cultural and ethnic backgrounds influence their attributions as well. For instance, students from families with traditional Asian cultural beliefs are more likely than students from mainstream Western culture to attribute classroom success and failure to unstable factors—effort in the case of academic achievement, and temporary situational factors in the case of appropriate or inappropriate behaviors (Li & Fischer, 2004; Lillard, 1997; Weiner, 2004). Also, some studies have found a greater tendency for African American students to develop a sense of learned helplessness about their ability to achieve academic success. To some extent, structural inequalities may contribute to their learned helplessness: Students may begin to believe that because of their background, they have little chance of success no matter what they do (Brody et al., 2006; Graham, 1989; van Laar, 2000).

Gender Differences In general, girls are more concerned than boys are about doing well in school: They tend to work harder on assignments, earn higher grades, and have a higher rate of high school graduation (Elmore & Oyserman, 2012; Marsh et al., 2008; McCall, 1994; Robinson & Lubienski, 2011). But some students perceive certain domains (e.g., writing, music) to be "for girls" and other domains (e.g., math, science) to be "for boys," dampening their interest and self-efficacy in seemingly opposite-gender content areas and thereby limiting their career options (Eccles, 2005; Gaspard et al., 2015b; Jacobs et al., 2002; Leaper & Friedman, 2007; Plante et al., 2013; Weisgram et al., 2010). Students' long-term life goals come into the picture as well: Girls are more likely than boys to consider how their career choices might mesh with their desires to work with people and to raise a family (Diekman et al., 2010; Eccles, 2009).

Another commonly observed gender difference is the tendency for girls (especially high-achieving girls) to be more discouraged by failure than boys are (Dweck, 1986, 2000). We can explain this difference, at least in part, by looking at gender differences in attributions. Some research indicates that boys tend to attribute their successes to fairly stable ability and their failures to a lack of effort, thus revealing an "I know I can do this" attitude. Girls sometimes show the reverse pattern: They may attribute their successes to effort and their failures to lack of ability, believing "I don't know whether I can keep on doing it because I'm not very good at this type of thing." Such differences are most often observed in stereotypically male domains (e.g., math, sports) and can appear even when boys' and girls' previous levels of achievement in the domains have been equivalent (Leaper & Friedman, 2007; McClure et al., 2011; Stipek, 1984; Vermeer et al., 2000).

Help boys discover the relevance of their classroom learning and performance to their long-term goals. Encourage girls to consider a wide range of career options and foster their self-efficacy for success in traditionally male domains.

Socioeconomic Differences Many students from low-income backgrounds want to do well in school (Payne, 2005; Shernoff, et al., 2001; Wilson & Corbett, 2001). However, teachers' attitudes, instructional practices, and relationships with students have a significant influence on whether these students choose to pursue academic success; this is especially true for students at high risk for academic failure (Anderson & Pellicer, 1998; Kumar et al., 2002; Maehr & Anderman, 1993; Murdock, 1999). Students from low-income families are apt to flourish in schools in which teachers have high expectations for achievement, engage students in high-interest activities and subject matter, emphasize mastery-approach goals over performance goals, and make students feel that they're valued members of the classroom community (Hom & Battistich, 1995; Juvonen, 2006; Osterman, 2000; Patrick et al., 2007).

Remember that meaningful, personally relevant classroom tasks are especially important for motivating students from lower-income backgrounds.

It's equally important that we increase the perceived value of school activities by making them relevant to students' personal lives and needs (Alexander et al., 1994; Knapp et al., 1990; Wlodkowski & Ginsberg, 1995). All too often, students at schools in low-income neighborhoods encounter instruction that focuses on basic skills and rote learning and thus is unlikely to entice even the most committed students (Becker & Luthar, 2002; Pianta & Hamre, 2009). Such instruction is not only boring but also unlikely to prepare students for the demands of a challenging high school or college curriculum (Ogbu, 2003; Suskind, 1998).

It's essential that we help all students acquire the skills and strategies they'll need to achieve their long-term goals for higher education and rewarding careers. In addition, if students have had little direct contact with college life or high-income professions, we must promote a realistic understanding of what college achievement and professional success involve. When speaking with a group of middle school boys who hoped to go to college, one researcher encountered considerable naiveté about college life:

> I asked them what they thought college was like. The response was nearly unanimous—it was all about partying—drinking, smoking weed, and hanging out. Never did it come up that they would attend classes or do homework. College meant partying, and that was why they wanted to go. (Williams, 2001a, p. 106)

Such misconceptions are perhaps not surprising if we consider how college life is often portrayed on television and in films. For adolescent viewers, college parties certainly yield more interesting plot lines than going to class and studying at the library.

Communicate that academic success requires hard work not only in the secondary grades but in college as well.

Accommodating Students with Special Needs Students with special educational needs are typically among those who show the greatest diversity in motivation. For example, students with learning disabilities or general intellectual disabilities may be discouraged by challenging tasks; some may even show signs of learned helplessness if their efforts consistently result in failure (Jacobsen et al., 1986; Louick & Muenks, 2022; Mercer & Pullen, 2005; Seligman, 1975). In contrast, students who are intellectually gifted may become easily bored or annoyed if classroom activities don't challenge their abilities (Bleske-Rechek et al., 2004; Winner, 2000b). Table 11.3 presents these and other motivational characteristics in students with special needs.

Chapter 5 identifies specific categories of special needs that fall within the five general categories listed in Table 11.3.

What Are My Teachers' Beliefs and Expectations for Me?

Learning Objective 11.3 **Describe how teachers' beliefs and behaviors affect student motivation.**

Students are not the only ones who make attributions. Teachers also make attributions about their students' behavior and achievement. These teacher beliefs are strongly related to their subsequent interactions with their students (Chang & Davis, 2009; Turner et al., 2011). Imagine that a student, Ava, fails to finish an assignment on time. Her teacher, Mr. Danner, might conclude that Ava (1) didn't try very hard, (2) used

STUDENTS IN INCLUSIVE SETTINGS

Table 11.3 Enhancing Motivation in Students with Special Educational Needs

Category	Characteristics You Might Observe	Suggested Strategies
Students with specific cognitive or academic difficulties	• Less intrinsic motivation to succeed at academic tasks, due in part to a low sense of self-efficacy • Reluctance to ask questions or seek assistance, especially in the secondary grades • Little or no persistence when confronting difficult tasks • Tendency to attribute poor achievement to low ability rather than to more controllable factors; learned helplessness regarding some classroom tasks	• Use extrinsic reinforcers to encourage effort and achievement; gradually phase out reinforcers as students show signs of intrinsic motivation. • Establish short-term goals that students perceive as being challenging yet accomplishable. • Offer assistance when you think students may really need it but refrain from offering help when you know students are capable of succeeding on their own. • Teach effective learning strategies and encourage students to attribute their successes to such strategies.
Students with social or behavioral problems	• Desire to succeed, despite behaviors that seem to indicate a lack of motivation • Tendency to interpret praise as an attempt at control (for students who exhibit defiance or oppositional behavior) • Stronger desire for power over classmates than for establishing friendships (for some students with emotional and behavioral disorders) • Little or no apparent interest in social interaction (for some students with autism spectrum disorders) • Perception of classroom tasks as having little relevance to personal needs and goals • Tendency to attribute negative consequences to uncontrollable factors (things "just happen")	• Provide the guidance and support students need to succeed at academic tasks. • Use subtle reinforcers (e.g., leave notes commending productive behaviors) rather than more obvious and seemingly controlling ones. • Offer some choices of activities and reinforcers to increase a sense of self-determination. • Help students discover the benefits of equitable and prosocial interactions with peers. • Relate the curriculum to students' specific needs and interests. • Teach behaviors that lead to desired consequences; stress cause-and-effect relationships between actions and outcomes.
Students with general delays in cognitive and social functioning	• On average, less intrinsic motivation than general education age-mates; occasional curiosity about certain topics • Responsiveness to extrinsic motivators • Tendency to give up easily in the face of difficulty • Limited or no ability to conceptualize long-term goals • Tendency to attribute poor achievement to low ability or to external sources rather than to more controllable factors; in some situations, a sense of learned helplessness	• Use extrinsic reinforcers to encourage productive behaviors; gradually phase out reinforcers as students show signs of intrinsic motivation. • Reinforce persistence as well as success. • Set specific, short-term goals; ask students to set some of their own goals as well. • Help students see the relationship between their own actions and resulting consequences.
Students with physical or sensory challenges	• Low sense of self-determination about the course of their lives • Fewer opportunities to satisfy the need for relatedness, especially with peers	• Teach self-regulating behaviors and independence skills. • Identify classmates who can serve as "study buddies" to help students with assignments or provide companionship at lunch and recess. • Collaborate with parents to promote interaction with classmates outside school.
Students with advanced cognitive development	• High self-efficacy and sense of competence • Eagerness for challenges; boredom when tasks don't challenge their abilities • Persistence in the face of failure (although some may give up easily if they aren't accustomed to failure) • Possible self-handicapping if there is a strong desire to affiliate with low-achieving peers • Social isolation (for some students who are exceptionally gifted) • Variety of interests, sometimes pursued with passion • Higher than average goal-directedness • Internal, optimistic attributions for achievement • Tendency to adopt a fixed mindset; can lead to learned helplessness if failure is encountered after an early string of successes (especially for girls)	• Provide opportunities for students to pursue complex tasks and activities over an extended period. • Give assignments that students find stimulating and challenging. • Keep quiet about students' exceptional achievements, especially if their friends don't value high achievement. • Provide opportunities to pursue individual interests, perhaps with other students who have similar interests or with an outside mentor. • Encourage students to set ambitious goals without expecting perfection.

SOURCES: Beirne-Smith et al., 2006; Brophy, 2004; Clark, 1997; Covington, 1992; Dai, 2010; Dawson & Bernier, 2007; Dunlap et al., 1994; Dweck, 2000; Foster-Johnson et al., 1994; Goldstein & Rider, 2006; Good & Brophy, 1994; Greenspan et al., 2004; Heward, 2009; Jacobsen et al., 1986; Knowlton, 1995; Louick & Muenks, 2022; Mendaglio, 2010; Mercer & Pullen, 2005; Patrick, 1997; Patton et al., 1996; Piirto, 1999; Powell & Nelson, 1997; Prout, 2009; Robertson, 2000; Schultz & Switzky, 1990; Shavinina & Ferrari, 2004; Turnbull et al., 2010; Ulke-Kurcuoglu & Kircaali-Iftar, 2010; Wehmeyer et al., 2007; Winner, 1997, 2000a, 2000b; Wong, 1991.

her time poorly, or (3) wasn't capable of doing the task. The conclusion he draws will depend on his prior beliefs about Ava—for instance, whether he thinks she (1) is lazy and unmotivated, (2) is both motivated and capable of doing the work but hasn't yet acquired effective self-regulation skills, or (3) has little innate capacity for learning.

Teachers' attributions for students' current behaviors affect their expectations for students' future performance; those expectations, in turn, affect future attributions (Weiner, 2000). Moreover, teachers' attributions and expectations influence the teaching strategies they use with particular students. For example, if Mr. Danner thinks Ava is "unmotivated," he might use some sort of incentive—perhaps offering free time later in the day—to entice her into completing assignments on time. If, instead, he thinks Ava lacks self-regulation skills, he might strive to teach her such skills. But if he thinks Ava has insufficient intelligence to master classroom topics, he may do very little to support her learning. Thus, the beliefs that we form about our students are related to our subsequent interactions with them.

Teachers typically draw conclusions about their students early in the year, forming opinions about each student's strengths, weaknesses, and potential for academic success. In many cases teachers size up their students fairly accurately: They know which ones need help with reading and which ones have short attention spans, and then adapt instruction accordingly (Goldenberg, 1992; Good & Brophy, 1994; Good & Nichols, 2001). Yet even the best teachers can make errors in their judgments. For example, teachers often underestimate the abilities of students who come from certain underrepresented groups or from low-income families (Ready & Wright, 2011; Rubie-Davies et al., 2006; Sirin & Ryce, 2010; van den Bergh et al., 2010). Although, on average, teachers are able to judge their students' cognitive abilities accurately, teachers in elementary schools in particular tend to overestimate the abilities of students in classes where the overall cognitive ability of students in the class is below average; in contrast, when the average cognitive abilities of students in a class are above average, teachers tend to underestimate individual students' abilities (Gnas et al., 2022). Moreover, teachers often believe the societal stereotype that girls are better at reading than boys; when boys have teachers who hold such beliefs, those boys may become less confident in their own beliefs about their abilities as readers over time (Retelsdorf et al., 2015).

Furthermore, many teachers have a *fixed mindset* about their students' abilities as learners: They believe that students' achievement typically depends on enduring, uncontrollable ability levels (Dweck & Molden, 2005; Oakes & Guiton, 1995; Reyna, 2000). Thus, they form fairly stable expectations for students' performance, which in turn lead them to treat students differently. When teachers have high expectations for students, they present more challenging tasks and topics, interact with students more frequently, and give more positive and specific feedback. In contrast, when teachers have low expectations for certain students, they present easy tasks, offer few opportunities for speaking in class, and provide only limited feedback (Babad, 1993; Good & Brophy, 1994; Graham, 1990; Rosenthal, 1994, 2002).

Continually ask yourself whether you are giving inequitable treatment to students for whom you have low expectations. Also reflect on your beliefs about students' intelligence: Are you taking a growth-mindset perspective that gives you optimism about future progress?

Teachers' attributions for students' performance often reveal themselves in the things they say to students (Dweck & Molden, 2005; Weiner, 2000). Consider the following interpretations of a student's success:

- "You did it! You're so smart!"
- "Your hard work has really paid off, hasn't it?"
- "It's clear that you really know how to study."
- "Terrific! This is certainly your lucky day!"

And now consider these interpretations of a student's failure:

- "Maybe this just isn't something you're good at. Perhaps we should try a different activity."
- "Why don't you practice a little more and then try again?"
- "Let's come up with some strategies that might work better for you."
- "Maybe you're just having a bad day."

All of these comments are presumably intended to make a student feel good. But notice the different attributions they imply—in some cases, stable and uncontrollable abilities (being naturally smart or incapable); in other cases, controllable and therefore changeable behaviors (hard work, lack of practice, effective or ineffective study strategies); and in still other cases, external, uncontrollable causes (a lucky break, a bad day). Teachers communicate their attributions for students' successes and failures in more subtle ways as well—for example, through the emotions they convey (Chang & Davis, 2009; Reyna & Weiner, 2001; Weiner, 2005). They're often sympathetic and forgiving when children fail for uncontrollable reasons (illness, lack of ability, etc.) but may get angry when children fail simply because they didn't try very hard.

How Teacher Attributions and Expectations Affect Students' Achievement

Most students readily pick up on teachers' subtle messages about their own and others' abilities (Butler, 1994; Good & Nichols, 2001; Weinstein, 2002). When teachers repeatedly convey low-ability messages, students may begin to see themselves as their teachers do, and behave accordingly (Marachi et al., 2001; Murdock, 1999; van den Bergh et al., 2010). In such cases, teachers' attributions and expectations can lead to a **self-fulfilling prophecy**: What teachers expect students to achieve becomes what students actually *do* achieve.

A classic study by Rosenthal and Jacobson (1968) provides an example. Near the end of the school year, researchers administered something they called the "Harvard Test of Inflected Acquisition" to elementary school students in a low-income neighborhood. Just before school resumed the following fall, the researchers gave teachers the names of students who, according to the test results, were expected to show dramatic achievement gains during the school year. In fact, the researchers had chosen these academic "spurters" at random. Despite the researchers' bogus predictions, the chosen children made greater achievement gains during the school year than their nonchosen classmates, and teachers rated these children in more favorable terms (e.g., as being more intellectually curious). The results were especially dramatic for children in grades 1 and 2.

Certainly, teacher expectations don't always lead to self-fulfilling prophecies. In some cases, teachers follow up on their initially low assessments of students' abilities by offering the instruction and assistance that students need to improve, and students *do* improve. In other cases, students may develop an "I'll show *you*" attitude that spurs them on to greater effort and achievement than a teacher anticipated. In still other cases, assertive parents step in and offer evidence that their children are more capable than a teacher initially thought (Dweck & Molden, 2005; Goldenberg, 1992; Good & Nichols, 2001).

When one of the authors of this book was a beginning teacher, his new colleagues went through all of his class rosters with him and gave him much prior information about his students. He was told about their prior achievement, their behavior, their family backgrounds, and just about anything else that his colleagues could think of. Providing such information can be helpful to an educator, but it also can influence teachers' expectations. For example, if a new teacher is told that "John cheats on tests," then the teacher may view John as being dishonest from the start; if John had decided to change his ways, he might have a difficult time escaping his prior reputation. On the other hand, this is certainly relevant information to share with colleagues. Thus, the decision about whether to provide such information to colleagues is complex; we need to weigh the implications of doing so and make careful decisions.

Research indicates that teachers' expectations—whether for individual students or for an entire class—*do* have an effect on achievement (Hattie, 2009; Kriegbaum et al., 2019; Rosenthal, 2002). If a teacher holds high expectations in a given subject area for a particular student, that student's self-perceptions of ability for that subject are likely to be high; consequently, such positive self-beliefs may contribute to the student's achievement (Szumski & Karkowski, 2019). On average, girls, students from low-income families, and students from underrepresented ethnic groups are more susceptible to teacher expectations than are boys from European American backgrounds. Teachers' expectations for children during the early grades are particularly influential on outcomes for low-income children; these effects can still be seen when the students are in high school (Sorhagen, 2013). Teacher expectations also appear to have a greater influence in the early elementary school years (grades 1 and 2), the first year of secondary school and, more generally, the first few weeks of school—in other words, at times when students are entering new and unfamiliar school environments (de Boer et al., 2010; Hinnant et al., 2009; Jussim et al., 1996; Kuklinski & Weinstein, 2001).

Be especially careful not to form unwarranted expectations for students at transition points in their academic careers.

We also need to recognize that sometimes our expectations can be affected by stereotypical beliefs that we might hold about race, gender, and other individual differences (e.g., DeCuir-Gunby et al., 2020). There is evidence that teachers do, at times, treat and evaluate students differentially based on personal characteristics, such as race, gender, and socioeconomic status (Babad, 1993; Garcia et al., 2019; Halberstadt et al., 2018). Although educators' biases may be unintentional, they can have significant consequences on the opportunities that are afforded to some students. For example, research indicates that Black youth are less likely to be recommended for gifted education programs (Ford, 2013; Wright et al., 2017) and are more likely to be suspended or expelled than are White youth (Skiba et al., 2011). Moreover, research indicates that teachers often overestimate the abilities of students from high socioeconomic families, compared to students from lower socioeconomic families (Brandmiller et al., 2020).

As teachers, we're most likely to motivate students to achieve at high levels when we attribute their successes and failures to things over which either they or we have control and when, as a result, we have realistically optimistic expectations for their performance. The Into the Classroom feature "Forming Productive Attributions and Expectations for Student Performance" presents several research-based strategies. However, we must be careful when we attribute either success or failure to students' *effort.* There are at least two occasions when effort attributions can backfire. To see what we mean, try the next exercise.

Experiencing Firsthand

Carberry and Seville #2

1. Imagine that Professor Carberry wants you to learn to spell the word *psychoceramics* correctly. He gives you 10 minutes of intensive training in spelling the word and then praises you profusely for spelling it correctly. In which of the following ways would you be most likely to respond?
   - **a.** You're delighted that he approves of your performance.
   - **b.** You proudly show him that you've also learned how to spell *sociocosmetology.*
   - **c.** You wonder, "Hey, is this all he thinks I can do?"
2. Now imagine that you drop by Professor Seville's office to find out why you did so poorly on her sociocosmetology exam. She smiles warmly and suggests that you simply try harder next time. But you tried as hard as you could the *first* time. Which one of the following conclusions would you be most likely to draw?
   - **a.** You need to try even harder next time.
   - **b.** You need to exert the same amount of effort the next time and keep your fingers crossed that you'll make some lucky guesses.
   - **c.** Perhaps you just weren't meant to be a sociocosmetologist.

Chances are good that you answered *c* to both questions. Let's first consider the situation in which Carberry spent 10 minutes teaching you how to spell *psychoceramics.* When students succeed at a very easy task and are then praised for their effort, they may get the unintended message that their teacher doesn't have much confidence in their ability (Graham, 1991; Schunk & Pajares, 2004). Attributing students' successes to effort is only beneficial when students have, in fact, exerted a great deal of effort.

Now consider the second scenario, in which Seville encouraged you to try harder even though you'd previously studied very hard indeed. When students fail at a task on which they've expended a great deal of effort and are then told that they didn't try hard enough, they're likely to conclude that they simply don't have the ability to perform the task successfully (Curtis & Graham, 1991; Robertson, 2000; Stipek, 1996). In such circumstances, it's usually better to attribute their failure to ineffective strategies. Students can and do acquire more effective learning and study strategies over time, especially when they're specifically trained to use these strategies. By teaching effective strategies, we not only promote students' academic success but also foster the belief that they can *control* their own success (Miranda et al., 1997; Weinstein et al., 1991).

Into the Classroom

Forming Productive Attributions and Expectations for Student Performance

- **Remember that teachers can definitely make a difference.** The teachers at a historically low-achieving middle school in a poor, inner-city neighborhood meet once a month to learn about teaching strategies that focus on developing early adolescents' study skills. They experiment with various strategies in their own classrooms and share their successes at their meetings.
- **Look for strengths in every student.** A 9-year-old girl who lives in a homeless shelter seems to have learned little about punctuation and capitalization, and her spelling is more typical of a first grader than a fourth grader. Nonetheless, the stories she writes often have unusual plot twists and creative endings. Her teacher suspects that her frequent moves from one school to another have left gaps in her knowledge of written language and finds a parent volunteer who can work with her on her writing several times a week.
- **Consider multiple possible explanations for students' low achievement and misbehavior.** Several seventh-grade teachers are sharing their experiences with a student who, at age 8, suffered a traumatic brain injury when he fell off a kitchen counter and landed on his head. His art and music teachers describe him as very disruptive in class and believe that he intentionally misbehaves in order to draw attention to himself. In contrast, his math and science teachers have found that he can easily stay on task—and can often achieve at average to above-average levels—so long as they provide reasonable structure for assignments and behavior. They also realize that some children with brain injuries have trouble inhibiting inappropriate behaviors through no fault of their own.
- **Attribute students' successes to a combination of ability and controllable factors such as effort and learning strategies.** In a unit on basketball, a middle school physical education teacher tells students, "From what I've seen so far, you all have the capability to play a good game of basketball. And it looks like many of you have been regularly practicing after school."
- **Attribute students' successes to effort only when they have actually exerted considerable effort.** A teacher observes that his students have completed a particular assignment more quickly and easily than he expected. He briefly acknowledges their success and then moves on to a more challenging task.
- **Attribute students' failures to factors that are controllable and easily remedied.** A high school student seeks his teacher's advice about how he might improve his performance in her class. "I know you can do better than you have been, Frank," she replies. "I wonder if part of the problem might be that with your part-time job and all of your extracurricular activities, you just don't have enough time to study. Let's sit down before school tomorrow and look at what and how much you're doing to prepare for class."
- **When students fail despite obvious effort, attribute their failures to a lack of effective strategies and help them acquire such strategies.** A student in an advanced science class is having difficulty with the teacher's challenging weekly quizzes. The student works diligently on her science every night and attends the after-school help sessions her teacher offers, but to no avail. The teacher observes that the student is trying to learn the material by rote—an ineffective strategy for answering the higher-level questions typically presented on the quizzes—and teaches her strategies that promote more meaningful learning.
- **Explicitly teach students to form productive attributions for their successes and failures.** A boy with a learning disability has particular trouble with mathematics. As his special education teacher works with him on developing his math problem-solving skills, she urges him to make self-talk statements that attribute failures to temporary setbacks he can overcome with more effort and different strategies—for example, "I mustn't give up. I need to use a different approach and see if that one might work better."

SOURCES: Brophy, 2006; Curtis, 1992; Dweck, 2000, 2009; Fowler & Peterson, 1981; Hattie, 2009; Hawley, 2005 (brain injury example); Langer, 2000; Robertson, 2000; Roeser et al., 2002; Skaalvik & Skaalvik, 2008; Weinstein et al., 1995.

Are Motivation and Engagement Basically the Same?

Learning Objective 11.4 **Explain the similarities and differences between motivation and engagement.**

So far, we have been discussing a variety of different ways of assessing and enhancing our students' motivation. Another term that you have probably heard is *engagemen*t. Researchers do make distinctions between motivation and engagement; although they are closely related to each other, they are not exactly the same (Eccles & Wang, 2012). In general, **engagement** is a broad term that describes the ways that students involve themselves with their academic work. Whereas many of the aspects of motivation that we have discussed represent enduring beliefs (e.g., self-efficacy beliefs) or goals (e.g., mastery goals) that may exist before, during, and after engaging with a particular task, engagement focuses more specifically on students' involvement with the tasks while they are actually working on them. It's easier to support our students' engagement when we examine different facets of engagement. Researchers generally distinguish between three types of engagement (Fredricks et al., 2004):

Cognitive engagement. Students who are cognitively engaged while working on academic tasks focus their attention on the task at hand. Cognitively engaged students apply effective learning and self-regulatory strategies while working on a task. This focus on the task allows cognitively engaged students to deal more effectively with challenges and with failure.

Behavioral engagement. Students who are behaviorally engaged while working on academic tasks demonstrate task-related behaviors that usually are observable. Students who are behaviorally engaged tend to follow class rules, exert effort, avoid engaging in disruptive behaviors, attend school regularly, pay attention to details, raise their hands to ask questions, participate in discussions, and become involved with extracurricular activities.

Emotional engagement. Students who are emotionally engaged experience positive emotions while working on a task. For example, emotionally engaged students often report they are feeling happy, in a good mood, and having fun while working on academic tasks. Those with low emotional engagement may simply not feel happy or be having fun; however, they also might experience truly negative emotions, such as boredom, anxiety, and sadness while working on academic tasks.

Some researchers have also suggested that **agentic engagement** is a fourth type of engagement that should be considered. Agentic engagement is characterized by students taking the initiative to express their opinions about academic content, readily offering their opinions and discussing their personal interests, and participating in reciprocated conversations with teachers about academic content and instruction (Reeve, 2013; Reeve et al., 2020).

Benefits of Academic Engagement

Research clearly indicates that engagement is related to an array of adaptive outcomes. Students who are engaged get high grades, are more likely to graduate from school (and less likely to drop out of school) (e.g., Fredricks et al., 2004; Ladd & Dinella, 2009; Wang & Holcombe, 2010). Highly engaged students also experience psychological well-being (e.g., Lewis et al., 2011) and are less likely to participate in risky behaviors such as substance abuse (Henry et al., 2012). Some strategies for promoting engagement are discussed in the following Into the Classroom section.

Into the Classroom

Promoting Engagement in the Classroom

- **Consistently teach and remind students about using effective self-regulation strategies.** Mr. Fidell's sixth-grade students are working on group projects about countries in the southern hemisphere. Students are given 40 minutes per day, over a one-week period, to work on these projects in class. When Mr. Fidell notices that one group always appears to be goofing off, he helps them to develop a plan in which group members set specific daily goals and review their progress on each goal at the start of the following class.
- **Remember that the whole school is responsible for promoting engagement, not just individual teachers.** The teachers at Bloomsbury High School have all agreed to try to get all students to participate in the school's annual homecoming activities. The teachers develop specific strategies to encourage students who are shy and who do not regularly interact with their peers to attend.
- **Consider the diversity of your students when attempting to promote their engagement.** There is a substantial Somali population in the neighborhood in which Mr. Washington teaches fifth grade. He found many short stories that represented his Somali students' interests. He incorporates these stories into the reading curriculum, both to engage his Somali students and to excite his other students about learning more about the culture that many of their classmates share.
- **Relate academic content to students' interests.** The third-grade teachers at Morning Glory Elementary School ask all their students to anonymously write down their favorite TV shows, movies, and summer activities. The teachers make sure to incorporate the students' preferences into their lessons.
- **Encourage students to set goals that are personally meaningful, and that allow them to challenge themselves to improve (rather than to set goals aimed at competing with other students).** During physical education class, Ms. Hemmings has her students do push-ups at the start of each class. She gives each student a sheet to keep track of how many push-ups they can do during each class session, and she encourages them to set the goal of increasing the number of push-ups by one per week.
- **Use diverse instructional strategies when teaching academic content.** Ms. Scheinlin uses a number of different activities when teaching science to her sixth-grade students. For each unit, she makes sure that students have opportunities to work on hands-on science activities, to engage with their peers in discussions related to the current science unit, and to see examples of how the science that they are learning is used in the real world.
- **Remember that engagement is multifaceted.** Mrs. Kim provides activities in her tenth-grade biology class that attempt to promote her students' cognitive engagement (by having her students respond to questions with no "right" or "wrong" answer during class sessions), behavioral engagement (by having her students do laboratory experiments during class), and emotional engagement (by conveying her own enthusiasm and enjoyment when the class is doing experiments).

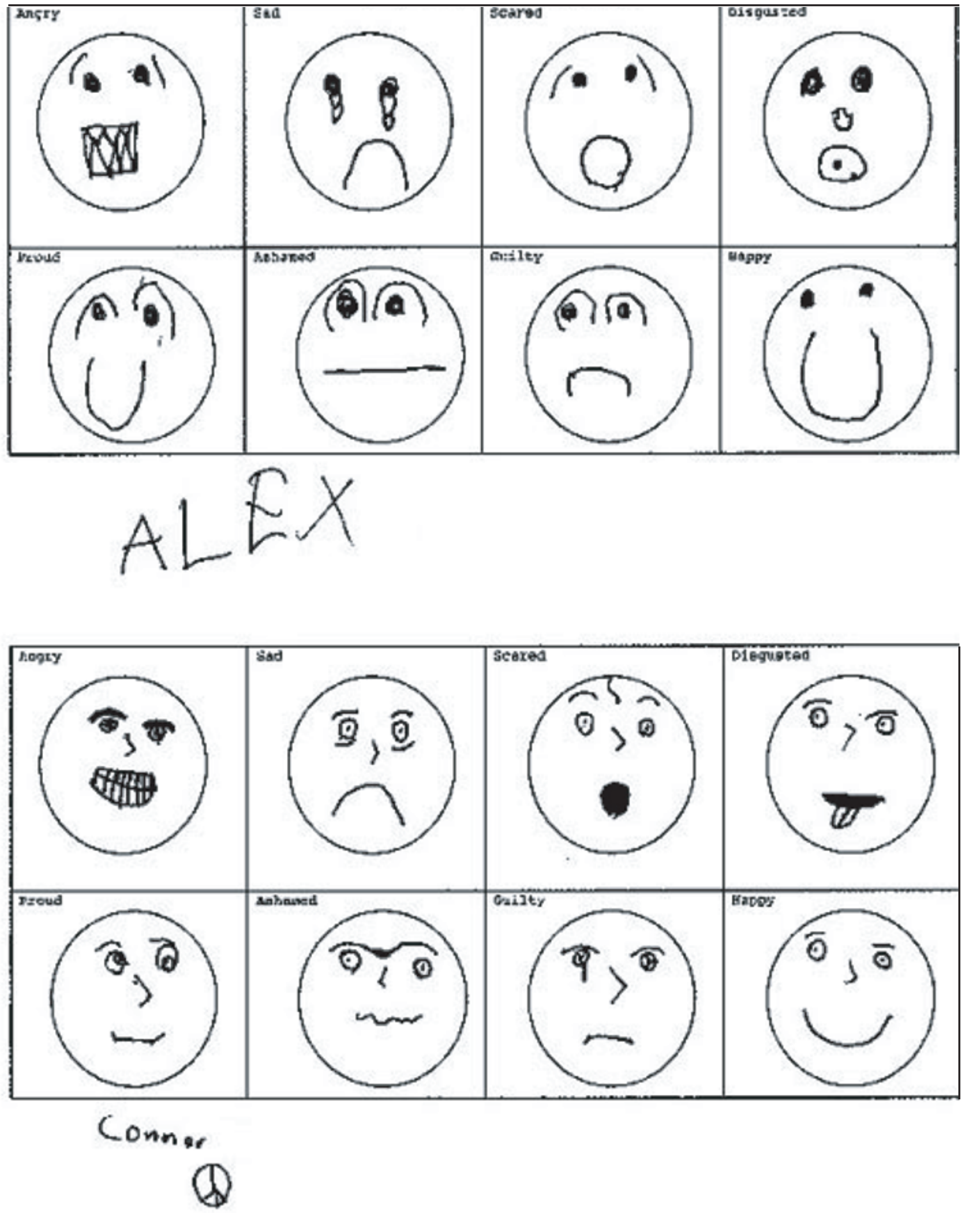
SOURCES: Anderman et al., in press; Bae & Lai, 2020; Böheim et al., 2020; Burns et al., 2019; Frenzel et al., 2018; Fredricks et al., 2019; Kilday & Ryan, 2019; Reschly et al., 2017; Wang & Hofkens, 2020.

How Do I Feel When I'm Working on Academic Tasks?

Learning Objective 11.5 Describe how various forms of affect are intertwined with motivation, learning, and cognition, and explain how you might promote productive affective states in students.

A close partner of motivation is **affect**: the emotions and general moods that a learner experiences while working on a task. Virtually any form of affect has both psychological elements (subjective feelings) and physiological elements (changes in heart rate, perspiration, muscular tension, etc.). Some forms of affect—such as happiness, excitement, and pride—feel both psychologically and physiologically pleasant, and are related to enhanced achievement. Other forms—such as fear, anger, and shame—feel both psychologically and physiologically aversive, and may hinder achievement (Pekrun et al., 2017). Affect develops early in life, and continues to develop through childhood (Easterbrooks et al., 2013). Affect has its basis in the brain, of course; the Applying Brain Research feature "Understanding Why and How Emotions Influence Learning" on page 425 provides more details. Figure 11.1 displays worksheets completed by two first graders; notice that even at this age, children understand the differences between a wide range of emotions.

Figure 11.1 Kindergartners Alex and Connor complete an activity in which they are asked to draw faces representing various emotions.



How Affect and Motivation Are Interrelated

Without doubt, people's automatic emotional reactions to certain events—for instance, a quick, fearful retreat from someone who is wielding a gun or knife—are designed to keep them alive. But affect also plays a significant role in the more planful, goal-directed aspects of human motivation. As a general rule, people act in ways they think will help them feel happy and comfortable rather than sad, confused, or angry, although they may occasionally work themselves into an angry frenzy as a way of achieving certain outcomes (Mellers & McGraw, 2001; Tamir, 2009; Tsai, 2007).

Some emotions, known as **self-conscious emotions**, are closely tied to people's self-evaluations and thus affect their sense of self-worth (Lewis & Sullivan, 2005; Pekrun, 2006). When people evaluate their own actions and accomplishments as being consistent with their culture's standards for appropriate and desirable behavior, they're apt to feel pride. When, in contrast, they see themselves as failing to live up to those standards—for instance, when they thoughtlessly cause harm to someone else—they're apt to feel guilt and shame.

Affect and motivation are interrelated in other ways as well. For instance, intrinsic motivation is closely connected with pleasure and enjoyment. Learners tackle challenging tasks more willingly and effectively when they enjoy what they're doing, and their successful efforts often bring on feelings of excitement and pride (Linnenbrink & Pintrich, 2004; Pekrun et al., 2002; Shernoff & Csikszentmihalyi, 2009). Learners are especially likely to feel excited about their successes if they didn't expect to be successful, but they'll also experience more intense negative emotions about their failures—and often about the activity in question—if they didn't expect to fail (Bower & Forgas, 2001; Shepperd & McNulty, 2002). Their specific reactions will depend on how they *interpret* the outcomes of events—in particular, whether they hold themselves, other people, environmental circumstances, or something else responsible for what has happened (recall the earlier discussion of *attributions*).

Another emotion we mustn't overlook is **boredom**—a generally unpleasant feeling that results from a lack of stimulation and arousal (Pekrun et al., 2010). Boredom-inducing activities can take a variety of forms: They might be either too easy or too difficult for learners' current ability levels, or they might involve repetitive, monotonous tasks that seemingly have little relevance to learners' lives. Learners who are bored in their current environment will either seek to escape it or else create their own stimulation—perhaps in the form of passing notes across the aisle or checking their phones for text messages. Students who are bored with the topic at hand are unlikely to pay much attention to or benefit from instructional activities. In addition, when students are bored, achievement suffers, and this lowered achievement leads to additional boredom (Daschmann et al., 2010; Nett et al.; Pekrun et al., 2010, Pekrun et al., 2014). A student who is neither intrinsically nor extrinsically motivated may very well be bored (see Chapter 10).

How Affect Is Related to Learning and Cognition As the Applying Brain Research feature reveals, brain structures that underlie affect and those that support cognition are closely interconnected. It's not surprising, then, that learners' affective reactions are often inextricably intertwined with their thinking and learning (Damasio, 1994; Meyer & Turner, 2002). For example, while learning how to perform a task, students simultaneously learn whether they like doing it (Zajonc, 1980). And students who feel frustrated and anxious when they struggle to master new material (as Elias initially does in the opening case study) may acquire a dislike for the topic (Carver & Scheier, 1990; Goetz et al., 2008; Stodolsky et al., 1991). Although affect is important for all of our students, we need to pay particular attention to young children's initial emotional reactions to early school experiences, because when young children start to associate going to school with negative emotions, their subsequent academic performance can suffer (Hernandez et al., 2018).

Learners can also associate specific topics and pieces of information with certain emotions—a phenomenon known as **hot cognition**. On average, learners are more likely to pay attention to, think actively about, and remember emotionally charged information (Bower, 1994; Heuer & Reisberg, 1992; Zeelenberg et al., 2006). Sometimes the nature of a topic itself evokes hot cognition, perhaps because it invokes feelings of sympathy for people in dire straits or a sense of outrage about blatant violations of someone's basic human rights. Information that conflicts with what learners currently know or believe can also evoke hot cognition. In particular, such information can cause learners considerable mental discomfort, something that Piaget called *disequilibrium* but many contemporary theorists call **cognitive dissonance**. This dissonance typically leads learners to try to resolve the inconsistency in some way, perhaps undergoing conceptual change or perhaps ignoring or discrediting the new information (Buehl & Alexander, 2001; Harmon-Jones, 2001; Zohar & Aharon-Kraversky, 2005). A contemporary example is the heated debates over climate change. Although scientists generally agree that the Earth's climate is changing, there is much debate about this issue, resulting in the expression of a variety of emotions (Muis et al., 2015; Sinatra & Hofer, 2021; Sinatra et al., 2012).

Get students emotionally involved with classroom subject matter.

How effectively learners think about and make sense of new information also depends on their overall affective state—their general *mood*—while they're studying. They're most likely to engage in meaningful learning and think creatively about a topic if they're in an emotionally positive frame of mind. If, instead, they feel generally sad, frustrated, or bored, they're apt to process new information in superficial, inflexible ways—for instance, through mindless rehearsal (Ahmed et al., 2013; Efklides, 2011; Fredrickson, 2009; Hernández et al., 2018; Pekrun, 2006; Snow et al., 1996). Keep in mind that teachers' moods affect their students' moods . . . if your students perceive that you are enjoying being in their company and are passionate about the content that you are teaching, they are more likely to experience positive emotions in your classroom (Frenzel et al., 2018). As teachers, we should remind our students that their moods affect their ability to study—thus we can tell our students that if they are in a very bad mood, they might want to put off studying until a later time (but not put it off indefinitely!).

One way to promote positive affect in the classroom, of course, is to address students' needs (e.g., for competence, relatedness, etc.). Researchers have suggested several additional ways in which we might increase positive affect:

- Occasionally incorporate game-like features into tasks and activities (e.g., crossword puzzles for practicing new spelling words, a game-show format for a history class review).
- Adjust task difficulty to a level that students believe they can handle.
- Encourage parents to provide emotional support at home.
- Have students ask themselves questions that help them focus on the positive aspects of classroom activities and school in general (e.g., "What excites me about —?" "What did I enjoy about —?"). (Brophy, 2004; Pekrun, 2006; Song et al. 2015; Townsend, 2008)

One form of affect—anxiety—can have either positive or negative effects on learning and cognition, depending on the circumstances. Because so many students experience anxiety at school, and because instructional practices and the classroom environment can contribute significantly to students' anxiety levels, we'll look at this particular form of affect more closely.

Applying Brain Research

Understanding Why and How Emotions Influence Learning

A key brain structure in affect is the *amygdala*, an almond-shaped part of the limbic system, which lies in the middle of the brain. We have two amygdalae, one each in our left and right hemispheres. The amygdala is especially active in unpleasant feelings (e.g., fear, stress, anger, and depression) and in automatic emotional reactions (e.g., impulsive aggression).

The amygdala has many interconnections with brain structures that underlie and support learning and cognition, including the hippocampus, anterior cingulate cortex, and prefrontal cortex. The amygdala alerts us to stimuli in our environment that might in some way threaten our survival. In addition, it enables us to associate particular emotions with particular stimuli or memories. As a result, affective reactions are often closely intertwined with human thinking and learning (Adolphs & Damasio, 2001; Kuhbandner et al., 2011; Phelps & Sharot, 2008; Posner & Rothbart, 2007).

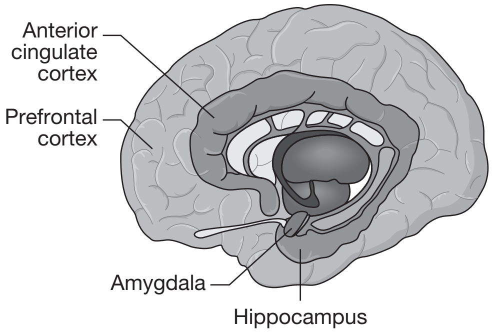
A good deal of emotion-based learning takes the form of *implicit knowledge*—knowledge over which we have little or no conscious awareness and control. For example, such out-of-awareness knowledge might lead us to feel anxious in certain situations without knowing *why* we feel anxious, and it can sometimes lead us to make decisions that are neither rational nor productive (Damasio, 1994; Marcus, 2008; Sapolsky, 2005).

With the close interconnections between emotion and cognition in mind, we offer two general recommendations:

- **Remember that, for better or for worse, learning often involves acquiring emotions as well as knowledge and skills.** Students' feelings are integral parts of what they "know" about various topics and events (Bower & Forgas, 2001; Clore et al., 2001; Minsky, 2006). Sometimes this knowledge is beneficial, but at other times it can work against students' best interests. For example, we would certainly like students to know that reading a good book can be a source of pleasure, but it's not helpful for them to "know" that mathematics may evoke frustration and anxiety.

- **Create conditions that foster arousal and attention without generating undue stress.** In Chapter 10 we suggested that humans may have a basic need for arousal—a basic need for either physical or cognitive stimulation—but that we also like our arousal to be at a certain optimal level that feels good. Arousal has an emotional element as well, and at very high levels it can feel quite unpleasant. High, stressful arousal levels increase activity in the amygdala in ways that interfere with the functioning of more "rational" structures such as the hippocampus and prefrontal cortex. Furthermore, lengthy periods of high stress—as might be true for someone who lives in chronically dangerous conditions—can cause permanent damage to the prefrontal cortex (Nisbett, 2009; Sapolsky, 2005).

In the classroom, piquing students' interest and engagement can effectively capitalize on the "good" side of arousal. In contrast, creating constant stress about doing well—and continually reminding students of the negative ramifications of *not* doing well—will adversely affect students' learning, development, and general well-being, quite possibly for the long term.



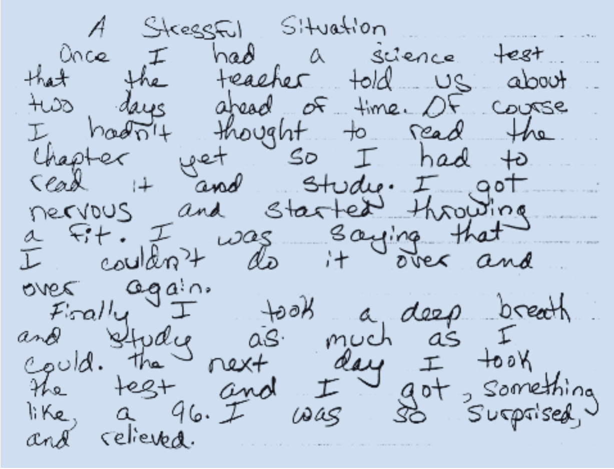
Anxiety in the Classroom

Imagine that, as a college student enrolled in Professor Carberry's advanced psychoceramics course, you must give a half-hour presentation about psychoceramic califractions today. You've read several books and numerous articles on your topic and undoubtedly know more about psychoceramic califractions than any of your classmates. Furthermore, you've meticulously prepared notes to which you can refer during your presentation. As you sit in class waiting for your turn to speak, you should be feeling calm and confident. But instead, you're a nervous wreck: Your heart is pounding wildly, your palms are sweaty, and your stomach is in a knot. When you are finally called to the front of the room, you have trouble remembering what you planned to say and can't read your notes because your hands are shaking. It's not as if you *want* to be nervous about speaking in front of your class, and you can't think of a single reason that you *should* be nervous. You're an expert on your topic, and your peers aren't likely to laugh at you if you make a mistake. So, what's the big deal?

You're a victim of **anxiety**: You have a feeling of uneasiness and apprehension about an event because you're not sure what its outcome will be. Anxiety has both cognitive and affective aspects (Carter et al., 2008; Hong et al., 2005; Tryon, 1980). Its cognitive aspect involves *worry*—troubling thoughts and beliefs about whether a situation can be effectively dealt with. Its affective aspect involves *emotionality*, which includes both physiological changes (e.g., muscular tension, a rapid heartbeat, increased perspiration) and such behavioral responses as restlessness and pacing. Anxiety is similar to fear, in the sense that both involve high levels of arousal. But the two emotions are different in one important respect: Although we're usually afraid of something in particular (e.g., a roaring lion or intense thunderstorm), we usually don't know exactly why we're anxious (Lazarus, 1991).

Almost everyone is anxious at one time or another. Many students become anxious just before a test they know will be difficult, and many get nervous before speaking to a large group. Such temporary feelings of anxiety are instances of **state anxiety**. However, some students are anxious much of the time, even when the situation isn't especially dangerous or threatening. For example, some students get excessively nervous even before very easy exams, and others may be so anxious about mathematics that they can't concentrate on even the simplest assignment. A learner who shows a pattern of responding with anxiety even in nonthreatening situations has **trait anxiety**, a chronic condition that often hampers performance.

Figure 11.2 This writing sample by 14-year-old Loretta illustrates how anxiety can sometimes improve learning and achievement.


A Stressful Situation
Once I had a science test
that the teacher told us about
two days ahead of time. Of course
I hadn't thought to read the
chapter yet so I had to
read it and study. I got
nervous and started throwing
a fit. I was saying that
I couldn't do it over and
over again.
Finally I took a deep breath
and study as much as I
could. the next day I took
the test and I got, something
like, a 96. I was so surprised,
and relieved.

Ann Shump

How Anxiety Affects Learning and Performance Imagine, for a moment, that you aren't anxious at all—not even the teeniest bit—about your grade in Carberry's psychoceramics class. Will you study for his tests? Will you turn in his assignments?

A small amount of anxiety often improves performance: It's **facilitating anxiety**. A little anxiety spurs learners into action—for instance, making them go to class, complete assignments, and study for exams (see Figure 11.2). In contrast, a great deal of anxiety usually interferes with effective performance: It's **debilitating anxiety**. Excessive anxiety distracts learners and interferes with their attention to the task at hand.

At what point does anxiety stop facilitating and begin to hurt performance? Very easy tasks—those that learners can do almost without thinking (e.g., running)—are typically facilitated by a high level of anxiety. But more difficult tasks—those that require considerable thought and mental effort—are best performed with only a small or moderate level of anxiety (Landers, 2007; Sapolsky, 2005; Yerkes & Dodson, 1908). A high level of anxiety in a complex situation can interfere with several aspects of cognition critical for successful learning and performance:

- Paying attention to what needs to be learned and using working memory effectively
- Processing information effectively (e.g., elaborating on or organizing it)
- Retrieving and using previously learned information and skills (Eysenck, 1992; Fletcher & Cassady, 2010; Hagtvet & Johnsen, 1992; Sarason, 1980; Vukovic et al., 2013)

Anxiety is especially likely to interfere with such cognitive processes when a task places heavy demands on either working memory or long-term memory—for instance, when a task involves problem solving or creativity. In such situations, learners may be so preoccupied with the possibility of doing poorly that they can't keep their minds on what they need to accomplish (Ashcraft, 2002; Beilock, 2008; Fletcher & Cassady, 2010; Turner et al., 1998; Zeidner & Matthews, 2005).

When asking students to perform difficult tasks, encourage them to do their best, but don't make them unnecessarily anxious about their performance.

Sources of Anxiety Learners sometimes develop feelings of anxiety about particular situations through the process of classical conditioning. They're also more likely to experience anxiety, especially debilitating anxiety, when they face a **threat**, a situation in which they believe they have little or no chance of succeeding. In contrast, learners can experience *facilitating* anxiety when they face a **challenge**—when they believe they can probably succeed with reasonable effort. Given learners' varying ability levels, tasks that promote facilitating anxiety for some of them can promote debilitating anxiety for others (Combs et al., 1976; Csikszentmihalyi & Nakamura, 1989; Deci & Ryan, 1992).

Classical conditioning is described in Chapter 6.

Children and adolescents are apt to have some degree of anxiety—possibly facilitating, possibly debilitating—in many of the following circumstances:

- *A situation in which physical safety is at risk*—for example, being regularly exposed to violence at school or in the neighborhood
- *A situation in which self-worth is threatened*—for example, hearing unflattering remarks about one's race or gender
- *Concern about physical appearance*—for example, feeling too fat or too thin, or reaching puberty either earlier or later than peers
- *A new situation*—for example, moving from one school to another midway through the year
- *Judgment or evaluation by others*—for example, receiving a low grade from a teacher or being disliked or excluded by peers
- *Frustrating subject matter*—for example, having a history of difficulty with one or more content domains (as is true for many students with learning disabilities)

- *Technology*—for example, not knowing how to use the hardware or software required for assigned tasks
- *Excessive classroom demands*—for example, being expected to learn a great deal of material in a very short time
- *Tests*—for example, facing a high-stakes test that affects one's chances for promotion or graduation
- *Physical challenges*—for example, being required to do push-ups in front of one's classmates
- *Concern about the future*—for example, not knowing how to make a living after graduation (Benner & Graham, 2009; Cassady, 2004, 2010; Chabrán, 2003; Covington, 1992; DuBois et al., 2002; King & Ollendick, 1989; Martinez & Huberty, 2010; Matthews et al., 2006; Phelan et al., 1994; Putwain et al., 2022; Stipek, 1993; Walton & Cohen, 2007; Williams, 2001a; Zeidner & Matthews, 2005)

Learners' particular concerns change somewhat as they grow older. Table 11.4 describes developmental trends in anxiety, as well as in affect more generally, across childhood and adolescence. For many children, one highly anxiety-arousing period is the transition from elementary school to secondary school—usually at the beginning of middle school or junior high but in some cases at the beginning of high school. We will look at this issue next.

A Multiple Whammy: Making the Transition to Secondary School Elementary school classrooms are often warm, nurturing places in which teachers get to know 20 to 30 students very well. Students in elementary classrooms also get to know *one another* quite well: They often work together on academic tasks and may even see themselves as members of a classroom "family." But somewhere around fifth to seventh grade, many students move from elementary school to a middle school or junior high school. As they do so, they simultaneously encounter numerous changes in the nature of their schooling:

- The school is larger and has more students.
- Students have several teachers, and each teacher has many students. Thus teacher–student relationships are more superficial and less personal than in elementary school, and teachers have less awareness of how well individual students are understanding what they are teaching.
- There is more whole-class instruction, with less individualized instruction that takes into account each student's academic needs.
- Classes are less socially cohesive. Students may not know their classmates very well and thus may be reluctant to ask peers for assistance.
- Students have more independence and responsibility regarding their learning. For example, they may have relatively unstructured assignments to be accomplished over a two- or three-week period, and they must take the initiative to seek help when they're struggling.
- Teachers place greater emphasis on demonstrating (rather than acquiring) competence, reflecting a shift from mastery-approach goals to performance goals. Thus, mistakes are more costly for students.
- Standards for assigning grades are more rigorous, so students may earn lower grades than they did in elementary school. Grades are often assigned on a comparative and competitive basis, with only the highest-achieving students getting As and Bs.
- There is an increase in the use of between-class ability grouping. Thus, students are more likely to label each other as "smart" or "not smart" in different subject areas.
- Students often fear that they will not fit in or belong in the new middle school environment.
- High-stakes tests—tests that affect promotion to the next grade level—become increasingly common. (Anderman & Green, 2019; Anderman & Mueller, 2010; Borman et al., 2019; Davis, 2003; Dijkstra et al. 2008; Eccles & Midgley, 1989; Hine & Fraser, 2002; Midgley et al., 2002; Wentzel & Wigfield, 1998; Wigfield et al., 2006; Yeung et al., 2011).

DEVELOPMENTAL TRENDS

Table 11.4 Affect at Different Grade Levels

Grade Level	Age-Typical Characteristics	Example	Suggested Strategies
K–2	• Possible culture shock and intense anxiety upon beginning school, especially if students have had little or no preschool experience • Possible separation anxiety when parents first leave the classroom (especially in the first few days of kindergarten) • Reduced anxiety when teachers and other adults are warm and supportive • Only limited control of overt emotional behaviors (e.g., may cry easily if distressed or act impulsively if frustrated)	Although Sarah has attended preschool since age 2, she's nervous about going to kindergarten. On her first day at the "big kids' school," she's reluctant to say good-bye to her mother. When Mom finally tells her she has to leave, she bursts into tears—a reaction that some of her classmates will taunt her about for several years.	Ask parents about routines followed at home; when appropriate, incorporate these routines into classroom procedures. If possible, provide an opportunity for students to meet you a few days or weeks before school begins. Be warm, caring, and supportive with all students (but check school policies about hugs and other forms of physical affection). Address inappropriate behaviors gently but firmly.
3–5	• Increasing control of overt emotional behaviors • Emergence of math anxiety for some students • Tendency for close friends (especially girls) to talk about and ruminate on negative emotional events; continues into adolescence • Possible stress as a result of others' racist and sexist behaviors (e.g., racial slurs, unkind remarks about emerging sexual characteristics); continues into adolescence	For 9-year-old Tina, basic arithmetic procedures with whole numbers are easy to understand. But she has difficulty learning fractions—how to find common denominators, divide one fraction by another, etc. —and becomes increasingly frustrated when her attempts to solve fraction problems yield incorrect answers. Her aversion to math soon leads her to avoid the subject whenever possible, both in and outside of school.	Ensure that students master basic concepts and procedures before proceeding to more complex material that depends on those concepts (especially important in math, a subject area in which advanced knowledge and skills build on more basic ones). Monitor students' behaviors for signs of serious anxiety or depression; talk with students privately if they seem overly anxious or upset and consult with the school counselor if necessary. Insist on respect for all students' characteristics, feelings, and backgrounds; don't tolerate racist or sexist remarks or actions.
6–8	• General decline in positive emotions; extreme mood swings, partly as a result of hormonal changes accompanying puberty • Increased anxiety and potential depression accompanying the transition to middle school • Decrease in enjoyment of school (especially for boys) • Increasing anxiety about peer relationships and social acceptance	At the beginning of seventh grade, 12-year-old Jeannie moves from a small elementary school to a large middle school, where she knows only a few students in each class, and her teachers present themselves as no-nonsense disciplinarians. Jeannie struggles in her efforts to make new friends and feels awkward when she must occasionally sit by herself in the cafeteria. Before long, she regularly complains of stomachaches so that she can stay home from school.	Expect mood swings but monitor students' behavior for signs of long-term depression. Make a personal connection with every student; express confidence that students can succeed with effort and offer support that can facilitate success. Design activities that capture students' interest; relate topics to students' personal lives and goals. Provide opportunities for students to form supportive friendships with classmates (e.g., assign cooperative group projects).
9–12	• Continuing emotional volatility (especially in grades 9 and 10) • Increasing ability to reflect on and control extreme emotional reactions • Considerable anxiety about school if transition to a secondary school format has been delayed until high school • Susceptibility to serious depression in the face of significant stress • Increasing prevalence of debilitating anxiety regarding tests, especially high-stakes tests • Feelings of uncertainty about life after graduation	In a text message to a classmate, 15-year-old Jonathan reveals his crush on a popular cheerleader. The classmate thinks the message is amusing ("I can't believe that loser thinks he has a chance with the head cheerleader!") and forwards it to more than 50 members of the sophomore class. Jonathan is at a loss about how to cope with his humiliation and contemplates suicide as the only solution to the problem. *(Teachers should* ***immediately*** *report any suspicions of planned suicides to school personnel who can effectively intervene.)*	Be especially supportive if students have just made the transition from an elementary school (e.g., show personal interest in students' well-being, teach effective study skills). Take seriously any signs that a student may be considering suicide (e.g., overt or veiled threats, such as "I won't be around much longer;" actions that indicate "putting one's affairs in order," such as giving away prized possessions). Give frequent assessments so that no single test score is a "fatal" one; help students prepare for high-stakes tests. Present multiple options for postgraduation career paths.

SOURCES: Arnett, 1999; Ashcraft, 2002; Benes, 2007; Benner & Graham, 2009; Chabrán, 2003; DuBois et al., 2002; Eccles & Midgley, 1989; Elkind, 1981; Gentry et al., 2002; Hill & Sarason, 1966; Hine & Fraser, 2002; Kerns & Lieberman, 1993; Kuhl & Kraska, 1989; Lapsley, 1993; Larson & Brown, 2007; Larson et al., 2002; Meyer & Turner, 2006; Midgley et al., 2002; Roderick & Camburn, 1999; Rose, 2002; Rudolph et al., 2001; Seiffge-Krenke et al., 2009; Snow et al., 1996; Spear, 2000; Thomas, 2005; Tomback et al., 2005; Wiles & Bondi, 2001.

Furthermore, previously formed friendships can be disrupted as students move to new (and perhaps differing) schools (Pellegrini & Long, 2004; Wentzel, 1999). And of course, students are also dealing with the physiological changes that accompany puberty and adolescence.

This multiple whammy of changes often leads to decreased confidence, a lower sense of self-worth, less intrinsic motivation, and considerable anxiety. Focus on peer relationships increases, and for many students, academic achievement drops. Some students become quite depressed or emotionally disengaged from the school environment, increasing the odds that they eventually will drop out of school (Anderman & Mueller, 2010; Cohen & Garcia, 2008; Danner, 2011; Eccles & Midgley, 1989; Gentry et al., 2002; Urdan & Maehr, 1995).

If students remain in a small elementary school-type environment in early adolescence, rather than moving to a larger middle or junior high school, their emotions and motivation are more likely to remain healthy and productive (Anderman, 1998, 2002; Midgley et al., 2002; Rudolph et al., 2001). By the time they reach ninth grade, however, they almost inevitably make the transition to a secondary school format, where they experience many of the changes that their peers elsewhere experienced a few grades earlier (Benner & Graham, 2009; Hine & Fraser, 2002; Midgley et al., 2002; Tomback et al., 2005).

Students who make a smooth transition to secondary school are more likely to be successful there and, as a result, are more likely to graduate from high school. The school environment we teachers create for adolescents can make a world of difference for their personal, social, and academic well-being (Anderman & Mueller, 2010; Wang & Holcombe, 2010). The Into the Classroom feature on p. 432 "Easing the Transition to Middle and Secondary School" suggests several strategies for teachers in the middle school and high school grades.

Keeping Students' Anxiety at a Facilitative Level Even when students aren't making a significant transition from one educational setting to another, they may have reasons to be anxious at school. We can address their concerns about social matters—for instance, their worries about peer relationships—by teaching social skills and planning activities that foster frequent and productive student interactions. And we can address their concerns about an uncertain future by teaching skills that will be marketable in the adult world and providing assistance with college applications.

Chapter 3 offers specific recommendations for promoting productive interactions with peers.

But perhaps most important, we must take steps to ensure that students don't become overly anxious about classroom tasks and subject matter. Because anxiety is—like all emotions—largely beyond students' immediate control, simply telling them to calm down is unlikely to be effective. The key is to prevent rather than "cure" debilitating anxiety. Following are several strategies that should keep students' anxiety at a facilitative level:

- Communicate clear, concrete, and realistic expectations for performance.
- Match instruction to students' cognitive levels and capabilities (e.g., use concrete materials to teach science concepts to students not yet capable of abstract thought).
- When students have a high level of trait anxiety, provide considerable structure to guide their activities.
- Provide supplementary sources of support for learning challenging topics and skills until mastery is attained (e.g., provide additional practice, individual or computerized tutoring, or a structure for taking notes).
- Teach strategies that can help students improve their overall learning and performance (e.g., effective study skills and self-regulation strategies).
- Assess students' performance independently of how well their classmates are doing and encourage students to assess their own performance in a similar manner.
- Provide feedback about specific behaviors, rather than global evaluations of performance.
- Encourage students to make attributions to internal, controllable factors.
- Provide students with multiple opportunities to practice retrieving previously learned information from long-term memory.
- Remind students that sometimes physiological reactions to academic work (e.g., feeling your heart beat faster or perspiration) may be signs of positive engagement ("your heart sometimes beats faster when you're really enjoying the work"), rather than signs of debilitating anxiety.
- Allow students to correct errors so that no single mistake is ever a "fatal" one. (Agarwal et al., 2014; Brophy, 1986; Fletcher & Cassady, 2010; Hattie & Timperley, 2007; Huberty, 2008; Jain & Dowson, 2009; Pekrun, 2006; Shute, 2008; Stipek, 1993; Strain et al., 2013; Tryon, 1980; Zeidner, 1998)

Chapter 14 offers specific strategies for keeping students' anxiety at reasonable levels during tests and other classroom assessments.

Students of all ages experience a wide range of emotions both in school and at home.

Socioemotional Learning

You have probably heard the term *socioemotional learning* (SEL) in various discussions about education. But what actually is socioemotional learning? The term is used broadly to refer to many different aspects of education, by many different individuals. Socioemotional learning is related to our discussion of motivation, engagement, and emotion.

Experiencing Firsthand

What Is Socioemotional Learning?

Before reading any further answer the following questions:

1. Imagine that you are a teacher, and that your school principal asks you to give your own definition of socioemotional learning during a faculty meeting. How would you respond?
2. Based on your response to question 1, can you think of one example of a teacher that you had when you were in school (before college) who emphasized socioemotional learning in their instruction? What specifically did that teacher do to emphasize socioemotional learning?

By now it is probably obvious to you that effective learning involves more than just memorizing facts. Learning is a complex, multifaceted process. Learning is influenced not only by children's and adolescents' cognitive and physical development, but also by their motivation, emotions, peer groups, classroom and neighborhood contexts, and numerous other factors. All of these factors are intertwined; thus, effective teachers acknowledge these various influences on student learning and consider these factors in their instruction. Although there have been many different definitions for SEL proposed over the years, one that we find particularly useful was derived by a large group of scholars who came together to identify the characteristics of effective SEL programs: SEL… "refers to the process through which individuals learn and apply a set of social, emotional, and related skills, attitudes, behaviors, and values that help direct their thoughts, feelings, and actions in ways that enable them to succeed in school, work, and life" (Jones et al., 2021, p. 14). When instruction emphasizes SEL, educators are actively attending to the social and emotional aspects of their students' learning and development (which is closely related to students' motivation and engagement).

When one examines empirical research, some definitive findings are evident:

- Students learn more effectively and achieve at higher levels when they are able to manage their emotions, regulate their approaches to learning (i.e., engage in self-regulated learning), and persist with challenging academic tasks, and when they understand how to manage and promote positive relationships with their peers and their teachers.
- When SEL is emphasized by teachers, classrooms overall have more positive climates and teachers are able to effectively manage student behavior.
- SEL skills can be learned through the implementation of evidence-based SEL programs.
- SEL programs must be aligned to both the developmental and cultural diversity of students.

Sources: Learning, 2021; Collie et al., 2019; Durlak et al., 2011; Jennings & Greenberg, 2009; Jones & Kahn, 2017; Jones et al., 2019, 2021).

Into the Classroom

Easing the Transition to Middle and Secondary School

- **Provide a means through which every student can feel part of a small, close-knit group.** During the first week of school, a ninth-grade math teacher forms three- to four-member groups that provide support and assistance for one another throughout the school year. At the beginning or end of every class period, the teacher gives group members five minutes to help one another with questions and concerns about daily lessons and homework assignments.
- **Find time to meet one on one with every student.** Early in the school year, while students are working on a variety of cooperative learning activities, a middle school social studies teacher schedules individual appointments with each of his students. In these meetings, he searches for interests that he and his students share and encourages the students to seek him out whenever they need help with academic or personal problems. Throughout the semester he continues to touch base with individual students (often during lunch or before or after school) to see how they're doing.
- **Make an effort to establish positive relationships with your students.** The teachers at one school all arrive at their classrooms 15 minutes before first period starts and stay in their rooms for at least 15 minutes at the end of the day, so students can drop by to chat. The teachers all eat lunch in the cafeteria with the students and sit with and talk with students during lunch every day.
- **Teach students the skills they need to be successful independent learners.** After discovering that few of her students know how to take effective notes, a high school science teacher distributes a daily notes "skeleton" that guides them through the note-taking process. The skeleton includes headings such as "Topic of the Lesson," "Definitions," "Important Ideas," and "Examples." As students' class notes improve over the course of the year, the teacher gradually reduces the amount of structure she provides.
- **Assign grades based on mastery, not on comparisons with peers, and provide reasonable opportunities for improvement.** A language arts teacher requires students to submit two drafts of every essay and short story he assigns; he gives students the option of submitting additional drafts as well. He judges each composition on several criteria, including quality of ideas, organization and cohesiveness, word usage, grammar, and spelling. He explains and illustrates each of these criteria and gives ample feedback on every draft that students turn in.
- **Be on the lookout for students who do not fit in with others and are excluded.** A group of middle school teachers notice that there are a few students who do not seem to be making friends, and often sit by themselves in the cafeteria. The teachers decide to form "discussion tables" in the cafeteria, where students can join a group to discuss various topics while eating lunch (e.g., current events, sports, video games, etc.). The teachers approach the students who always eat by themselves and invite them to join one of the discussion tables.

Although at times SEL programs have been considered controversial by some, such feelings may result from an inadequate understanding of what SEL actually is. Research clearly indicates that the inclusion of a focus on SEL, through evidence-based instructional strategies, is related to myriad positive benefits for students. There are several resources available to help educators to find effective, evidence-based SEL programs. Some of these include Harvard University's "Explore SEL" website (http://exploresel.gse.harvard.edu/), and the website of the Collaborative for Academic, Social, and Emotional Learning (CASEL) (casel.org).

Diversity in Affect

Some people seem to be consistently more emotionally upbeat than others—an individual difference variable that's probably rooted in biology to some degree (Costa & McCrae, 1992; Peterson, 2006). In addition, researchers have observed some consistent differences in affect in students of different cultural and ethnic backgrounds, genders, and socioeconomic levels.

Cultural and Ethnic Differences On average, cultural groups differ in the degree to which they show their feelings in their behaviors and facial expressions. For example, whereas Americans and Mexicans are often quite expressive, some people from East Asian cultures tend to be more reserved and may be reluctant to confide in others in times of sadness or distress (Camras et al., 2006; Cole & Tan, 2007; Kim et al., 2008). Cultures probably differ most in the extent to which they tolerate overt expressions of anger. Mainstream Western culture encourages children to act and speak up if someone infringes on their rights and needs, and expressing anger in a nonviolent way is considered quite acceptable. In many Southeast Asian cultures, however, any expression of anger is viewed as potentially undermining adults' authority or disrupting social harmony (Adam et al., 2010; Mesquita & Leu, 2007; Tsai, 2007). Children brought up in some Buddhist communities are encouraged to not even *feel* anger (Cole et al., 2002; Cole et al., 2006).

Even seemingly "positive" emotions aren't always viewed favorably. Some cultures that place a high priority on social harmony discourage children from feeling pride about personal accomplishments, because such an emotion focuses attention on an individual rather than on the overall group (Eid & Diener, 2001). And for some cultural groups, joy and happiness can sometimes be too much of a good thing. For example, many Chinese and Japanese advocate striving for contentment and serenity—relatively calm emotions—rather than joy (Kagan, 2010; Mesquita & Leu, 2007; Tsai, 2007).

Keep in mind that some students may have been socialized to hide their emotions.

Finally, learners from various cultural backgrounds may have somewhat different sources of anxiety. For instance, some children and adolescents from Asian American families may feel family pressure to perform well in school, leading to debilitating test anxiety (Pang, 1995; Woody et al., 2015). Students who belong to racial or ethnic groups that are clearly underrepresented at their school—for example, African American students at a predominantly White school, or vice versa—may be especially anxious about whether their majority-group classmates will accept them without prejudice (Cohen & Garcia, 2008). And recent immigrants are often anxious about a variety of things in their new country: how to behave, how to interpret other people's behaviors, how to make friends, and, more generally, how to make sense of the strange new culture in which they now find themselves (Cole & Tan, 2007; Dien, 1998; Igoa, 1995).

Be especially sensitive to sources of anxiety for different cultural and racial groups and for recent immigrants.

Anxiety may be at the root of a phenomenon known as **stereotype threat** (which we mentioned in Chapter 4), which can lead students from stereotypically low-achieving groups to perform more poorly on assessments than they otherwise would, simply because they're aware of the stereotype (Aronson & Steele, 2005; Ryan & Ryan, 2005; Smith, 2004). When students are aware of the unflattering stereotype—and especially when they know that the task they're performing reflects their ability in an important domain—their heart rate and other physiological correlates of anxiety go up and their performance goes down (McKown & Weinstein, 2003; Osborne & Simmons, 2002; Walton & Spencer, 2009). We're more likely to see the negative effects of stereotype threat when students interpret their performance as an evaluation of their general competence and self-worth (Davies & Spencer, 2005; Huguet & Régner, 2007; McKown & Weinstein, 2003). Furthermore, stereotype threat is more likely to arise when students have a fixed mindset (Dweck et al., 2004; Good et al., 2003; Osborne et al., 2010).

Seek professional assistance with anger management training if a student frequently lashes out in anger.

Gender Differences In general, girls express their emotions more openly than boys do. However, girls sometimes hide angry feelings in order to preserve social harmony, whereas boys are often quite willing to show their anger (Eisenberg et al., 1996; Lippa, 2002; Sadker & Sadker, 1994). Girls are also more anxious about their classroom performance, which may partly explain their greater diligence in schoolwork (Marsh et al., 2008; Pomerantz et al., 2002). For instance, girls are more prone to test anxiety than are boys; some become victims of stereotype threat, earning lower scores than they should on tests in stereotypically "male" domains such as math (Ben-Zeev et al., 2005; Hong et al., 2005; Huguet & Régner, 2007). Visuospatial working memory may be particularly affected in girls when they experience anxiety (Ganley & Vasilyeva, 2014). But girls and boys alike can experience considerable stress at school, especially in adolescence—perhaps about academic struggles, broken friendships, or romantic relationships—and they don't always have productive strategies for coping with their disappointments (Frydenberg & Lewis, 2000; Seiffge-Krenke et al., 2009). Clearly, then, students of both genders may sometimes need extra social and emotional support.

Be especially supportive when a student experiences extreme stress at school or elsewhere.

Socioeconomic Differences Students from low-income families are, on average, more prone to anxiety and depression than their higher-income classmates (Ashiabi & O'Neal, 2008; Evans et al., 2005; Morales & Guerra, 2006; Yatham et al., 2018). Furthermore, students in low-income school districts are especially at risk for making a rough transition from elementary to secondary school (Ogbu, 2003; Roderick & Camburn, 1999). Accordingly, students from low socioeconomic backgrounds are apt to have a greater-than-average need for our emotional and social support, and they are the ones who are most likely to benefit from a consistently warm and nurturing classroom environment (Becker & Luthar, 2002; Masten, 2001; Milner, 2006).

Be especially attentive to the emotional needs of children from low-income families.

In bringing our discussion of motivation and affect to a close, we must emphasize once again an important point: We teachers can—and *should*—make a significant difference in the lives of children and adolescents. Through the academic and social skills we teach them, the classroom atmosphere we create for them, and the individualized instructional and emotional support we give them, we can greatly enhance students' ability to be both productive and happy.

Motivating Students in Any Environment

Learning Objective 11.6 Explain how ideas from different theories can be used to motivate your students

So how can we use all of this information? One of the issues that teachers often face is that some of the motivation theories seem to contradict each other. You might be wondering how you can promote intrinsic motivation and lower test anxiety while simultaneously working in a school that gives out many rewards or that mandates a great deal of testing.

These are normal concerns, and teachers who are most effective at motivating their students understand that they need to use a balanced approach. Few educators work in environments where they can guarantee a classroom environment that will allow them to solely emphasize adaptive components of motivation theories. Let's look at an example of this struggle.

Experiencing Firsthand

Promoting Positive Motivational Beliefs

Mr. Murphy is a social studies teacher in a middle school where there is much mandated testing. Many of the parents are focused on getting their children prepared for admission into competitive colleges. In addition, the school has an honor society, and membership in the honor society elevates the social status of students. Nevertheless, Mr. Murphy feels frustrated sometimes, because he wants to promote positive motivational beliefs in all of his students, but he often feels that the context of his school inhibits his efforts. What can Mr. Murphy do to promote positive motivational beliefs?

Mr. Murphy's problems are not unique. Most educators work in environments where school policies and local contexts make it difficult to develop positive motivational beliefs. As teachers we need to promote desirable motivational beliefs within such contexts; this may seem impossible, but it actually is not. If we promote productive motivational beliefs as much as possible, we can help struggling students. Figure 11.3 offers some suggestions for how to promote a positive motivational climate, even when other factors may seem to frustrate your efforts.

Figure 11.3 Strategies to promote positive motivational climates in any setting.

HOW TO PROMOTE...	STRATEGIES THAT CAN BE USED IN ANY ENVIRONMENT:
High Expectancies	Set short-term goals so that students experience success.
	Hold high expectations while also providing support so that students can meet your expectations.
Achievement Values	Present examples of how content that you are teaching is important in the real world.
	Give examples of careers in which the content is important.
	Allow students to explore topics of personal interest.
	When students get frustrated, give them concrete examples of why it is worth their time to persist with a task.
Adaptive Attributions	Carefully think about the feedback that you provide to students when they get a bad grade.
	Convey the message that all learners have to persist and try hard.
	When students make maladaptive attributions (e.g., "I failed because I'm stupid"), correct these beliefs by redirecting them toward more appropriate attributions (e.g., "You failed because you didn't study for the test effectively—let's develop a study plan so this doesn't happen again.").
Endorsement of Mastery-Approach Goals	When possible, eliminate time constraints and strict deadlines.
	Allow students who have not mastered content and who get a poor grade on an assignment to redo the assignment and have it re-graded.
	Encourage and reward students for taking on challenging assignments.
Low Anxiety	Don't talk too much about tests.
	When students are working on difficult tasks, encourage them to take breaks.
	Offer positive feedback while students are working on challenging tasks to show them that they are making progress.
	If a student is extremely stressed by a particular exam or assignment, consider an alternate approach to assessment (e.g., instead of a timed test in class, allow the student to take the test after school and to have additional time).
Belongingness	Use cooperative learning techniques and other group activities in which all group members play important roles.
	If you see any signs of bullying or social exclusion, deal with those promptly (see Chapter 12).
	If a student appears to not interact with others, tactfully find ways to involve that student in group activities.
	Encourage students who are natural leaders to work with you to create a positive classroom environment.
	Use a wide variety of assessments in determining students' grades (i.e., don't just focus on a few high-stakes exams).

Chapter 11 What Have You Learned?

We now return to the chapter's learning objectives and identify some key points related to each one.

Motivation is something that both new and experienced teachers think about all the time as they plan instruction (Camacho & Parham, 2019). In this chapter, we have examined some additional questions that students ask themselves when they approach academic tasks and discussed how students' responses to these questions affect their motivation and learning. We also expanded our discussion of motivation to examine the related concepts of academic engagement and academic emotions. Taken together, the strategies and research presented in this chapter demonstrate that whereas motivation may be more complicated than you originally imagined, there are evidence-based instructional practices that you can implement in your classroom to promote positive motivation in all of your students.

11.1 Explain how learners' goals impact their motivation and learning. Learners typically have a number of *goals,* including achievement goals (perhaps to master particular topics and skills), work-avoidance goals, social goals, and long-term life goals. Sometimes learners can accomplish multiple goals simultaneously, but in other cases, they can't; for instance, learners can address both their achievement goals and their social goals by forming a study group for a challenging course, but it's quite difficult to master a topic while also avoiding hard work. As teachers, we should encourage mastery-approach goals as much as possible—for example, by focusing on genuine understanding of material and by communicating that learning involves exerting effort and making mistakes—but we must also help students achieve other goals important for their well-being, such as certain performance goals, social goals, and long-term life goals.

Learners also approach academic tasks with different mindsets. When students have a growth mindset, they believe that they have the ability to learn new information (even complex information) if they work hard and practice. In contrast, when students have a fixed mindset, they believe that their abilities are limited, and that there are certain topics that they simply can't learn. As teachers, we can encourage students to adopt a growth mindset by allowing them to experience success and by reminding them about their potential as learners.

11.2 Explain how learners' beliefs about why they did or did not succeed at various tasks impacts their motivation and learning. Learners' self-constructed explanations of their successes and failures—their *attributions*—influence their learning and performance as well. As students move through the grade levels, many of them increasingly attribute these outcomes to a fixed, uncontrollable ability; those students who, in contrast, believe they can improve their performance with hard work and more effective strategies achieve at higher levels over the long run.

11.3 Describe how teachers' beliefs and behaviors affect student motivation. As teachers, we form beliefs about why our students achieve at different levels and display different abilities (i.e., attributions). These attributions affect our interactions with students, and ultimately can affect students' future motivation and achievement. We communicate our beliefs to our students both directly (e.g., via comments that we make to them) and indirectly (e.g., through our emotions or nonverbal communications). If we repeatedly convey to students that we believe that their abilities are limited, we may create self-fulfilling prophecies, wherein our expectations for our students affect their actual academic performance. We teachers can foster more optimistic and productive attributions, in part, by conveying the message—not only through our words but also through our actions—that students can, indeed, have considerable control over their destinies.

11.4 Explain the similarities and differences between motivation and engagement. Whereas motivation refers to a broad set of beliefs and goals, engagement refers more specifically to students' involvement with academic tasks while they are actually working on those tasks. Student engagement can be described in terms of three categories: cognitive, behavioral, and emotional.

11.5 Describe how various forms of affect are intertwined with motivation, learning, and cognition, and explain how you might promote productive affective states in students. The emotions and general moods that learners bring to bear on a task—collectively known as *affect*—are closely intertwined with motivation. Affect is connected with learning and cognition as well; for example, students typically learn and remember more when they're emotionally as well as cognitively involved in classroom topics.

One form of affect—anxiety—has particular implications for learning. A small amount of anxiety often facilitates learning and performance, but a great deal of anxiety typically impedes them, especially when difficult tasks are involved. In most circumstances, we should strive to keep students' anxiety at a low to moderate level—for example, by clearly communicating expectations for achievement and by ensuring that students have a good chance of being successful with reasonable effort.

Socioemotional learning (SEL) is a widely used term that refers to the inclusion of instructional practices that acknowledge the broad array of influences on student learning. Although SEL has at times been controversial, research indicates that when evidence-based SEL programs are implemented with fidelity, students achieve at higher levels. Moreover, classroom climates are more positive and student behavioral problems are relatively low when SEL is implemented.

11.6 Explain how ideas from different theories can be used to motivate your students. There are very specific research-informed strategies that educators can implement to enhance student motivation. It is important to remember that motivation is not a one-size-fits-all concept. Different strategies affect different aspects of academic motivation.

Practice for Your Licensure Exam

When "Perfect" Isn't Good Enough

Mrs. Gaskill's second graders are just beginning to learn how to write the letters of the alphabet in cursive. Every day, Mrs. Gaskill introduces a new cursive letter and shows her students how to write it correctly. She also shows them some common errors in writing the letter—for instance, claiming that she's going to make the "perfect f" but then making it much too short and crossing the lines in the wrong place—and the children delight in finding her mistakes. After the class explores the shape of a letter, Mrs. Gaskill asks her students to practice the letter, first by writing it in the air using large arm movements and then by writing it numerous times on lined paper.

Meanwhile, Mrs. Gaskill has decided to compare the effects of two kinds of praise on the children's performance. She has placed a small colored sticker on each child's desk to indicate membership in one of two groups. When children in Group 1 write a letter with good form, she gives them a happy-face token, says "Great!" or "Perfect!" and either smiles at them or gives them a pat on the back. When children in Group 2 write a letter with good form at least once, she gives them a happy-face token and says something like "You sure are working hard," "You can write beautifully in cursive," or "You are a natural at this." When children in either group fail to meet her standards for cursive writing, she gives them whatever corrective feedback they need.

Thus, the only way in which Mrs. Gaskill treats the two groups differently is in what she says to them when they do well, either giving them fairly cryptic feedback (for Group 1) or telling them that they are trying hard or have high ability (for Group 2). Despite such a minor difference, Mrs. Gaskill finds that the children in Group 2 say they enjoy cursive writing more, and they use it more frequently in their spelling tests and other writing tasks. Curiously, too, the children in Group 1 often seem disappointed when they receive their positive feedback. For instance, on one occasion a girl who writes beautifully but has the misfortune of being in Group 1 asks, "Am *I* a natural at this?" Although the girl consistently gets a grade of "+" for her cursive writing, she never writes in cursive voluntarily throughout the 3-week period in which Mrs. Gaskill conducts her experiment. (Study described by Gaskill, 2001)

1. **Multiple-choice question:**

   Which one of the following observations best supports the conclusion that the children in Group 2 have greater *intrinsic* motivation than the children in Group 1?

   a. The children in Group 2 get more detailed feedback.
   b. The children in Group 2 seem happier when Mrs. Gaskill reinforces them.
   c. The children in Group 1 seem disappointed about the feedback they get.
   d. The children in Group 2 use cursive writing more frequently in other assignments.

2. **Constructed-response question:**

   Explain why the praise given to Group 2 might be more motivating than the praise given to Group 1. Base your explanation on contemporary principles and theories of motivation.

3. **Constructed-response question:**

   Might the feedback given to Group 1 ("e.g., Great!" "Perfect") be more effective if Mrs. Gaskill used it for all, rather than just some, of her students? Explain your reasoning.

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 12

Creating a Setting Conducive to Learning

Kali9/E+/Getty Images

Learning Objectives

12.1 Describe numerous strategies for creating a classroom environment conducive to academic achievement and students' personal well-being.

12.2 Explain how you can coordinate your efforts with colleagues, community agencies, and parents to maximize students' academic and personal development.

12.3 Identify six general approaches to dealing with student misbehavior and the circumstances and cultural contexts in which each approach might be appropriate.

12.4 Describe a three-tiered approach that can effectively reduce aggression and violence in the overall school community, as well as additional strategies you might use to address gang-related hostilities.

CASE STUDY

A Contagious Situation

After receiving a teaching certificate in May, Ms. Cornell has accepted a position as a fifth-grade teacher. She has spent the summer identifying instructional goals for the year and planning lessons that should help students achieve those goals. Today, on the first day of school, she has jumped headlong into the curriculum she planned. But three problems quickly present themselves—in the forms of Eli, Jake, and Vanessa.

These three students seem determined to disrupt the class at every possible opportunity. They move around the room without permission, intentionally annoying others as they walk to the pencil sharpener or wastebasket. They talk out of turn, often in disrespectful ways, to their teacher and peers. They rarely complete assignments, preferring instead to goof off or play practical jokes on each other and on their classmates. They seem especially prone to misbehavior during downtimes in the daily schedule—for example, at the beginning and end of the day, before and after recess and lunch, and whenever Ms. Cornell is preoccupied with other students.

Ms. Cornell continues to follow her daily lesson plans, ignoring her problem students and hoping they'll eventually shape up. Yet the disruptive behavior continues, with the three of them delighting in one another's antics. Furthermore, the misbehavior begins to spread to other students. By the middle of October, Ms. Cornell's classroom is out of control, and the few students who are still interested in learning something are having a hard time doing so.

- In what ways has Ms. Cornell planned in advance for her classroom? In what ways has she *not* planned?

As a first-year teacher, Ms. Cornell is well prepared in some respects but not at all prepared in others. She has carefully identified her instructional goals and planned relevant lessons. But she has neglected to think about how she might keep students on task or how she might adjust her lessons based on how students are progressing. And she hasn't considered how she might nip behavior problems in the bud, before they begin to interfere with learning. In the absence of such planning, no curriculum can be effective—not even one grounded firmly in contemporary theories of learning, development, and motivation.

Learning always takes place within particular contexts—for instance, within physical settings, social groups, and cultures. In academic learning, one important context is, of course, the classroom. Skillful teachers not only choose instructional strategies that foster effective learning but also create a classroom environment that keeps students engaged in productive activities. They certainly deal with the inappropriate behaviors that occur, but their emphasis is on *preventing* such behaviors. As we explore classroom management strategies in this chapter, our focus, too, will be on prevention. Moreover, we'll be referring back to some of the information presented in Chapters 10 and 11, because when students are motivated and engaged, they are less likely to be distracted and disruptive. We'll also frequently return to the opening case study and consider how Ms. Cornell might have gotten the school year off to a better start.

Creating a Setting Conducive to Learning

Learning Objective 12.1 Describe numerous strategies for creating a classroom environment conducive to academic achievement and students' personal well-being.

Classroom management involves creating and maintaining a classroom environment conducive to students' learning and achievement. Students definitely learn more in some classrooms than in others. Consider these four classes as examples:

- Mr. Bradley's class is calm and orderly. Students work independently in their seats, and all of them appear to be concentrating on individually tailored tasks.

Occasionally, students approach Mr. Bradley to seek clarification of an assignment or to get feedback about a task they've completed, and he quietly confers with them.

- Mr. Boitano's class is chaotic and noisy. A few students are doing their schoolwork, but most are engaged in nonacademic activities. One girl is painting her nails, a boy nearby is playing games on a smartphone, and several others are attacking one another with paper clips and rubber bands.
- Mr. Cavalini's class is as noisy as Mr. Boitano's. But rather than playing on their smartphones, students are debating—often loudly and passionately—the causes of climate change. After 20 minutes of heated discussion, Mr. Cavalini stops the conversation, lists students' various arguments about climate change on the board, and then explains why there's no simple "correct" resolution of the issue.
- Mr. Durocher believes that students learn most effectively when rules for their behavior are clearly spelled out, so he has 53 rules that cover almost every conceivable occasion: "Always use a ballpoint pen with blue or black ink," "Don't submit assignments on torn-out pages from spiral notebooks," "Don't ask questions unrelated to the lesson," and so on. He punishes each infraction severely enough that students follow the rules to the letter. His students are quiet and obedient, but their achievement levels remain discouragingly low.

Two of these classrooms are quiet and orderly; the other two are active and noisy. But as you can see, the activity and noise levels are poor indicators of how much students are learning. Students are learning in Mr. Bradley's quiet class and in Mr. Cavalini's noisier one. Neither the students in Mr. Boitano's loud, chaotic battlefield nor those in Mr. Durocher's peaceful dictatorship seem to be learning much. A well-managed classroom is one in which students are consistently engaged in productive learning activities and in which students' behaviors rarely interfere with the achievement of instructional goals (Aldrup et al., 2018; Brophy, 2006; Doyle, 1990; Emmer & Evertson, 1981). It *isn't* one in which students' every move is tightly controlled.

Creating and maintaining an environment in which students are continually engaged in productive activities can be challenging. We must always be aware of the unique needs of many different students, know how to coordinate several activities at once, and be able to make quick decisions about how to respond to unanticipated events. Furthermore, we must vary our management techniques considerably, depending on the instructional strategies in progress. It isn't surprising, then, that many beginning teachers mention classroom management as their number one concern (Evertson & Weinstein, 2006; Jones, 1996; Veenman, 1984), and that some teachers who experience difficulties managing behavior consider leaving the profession (Marsh, 2015).

A good general model of effective classroom management is *authoritative parenting.* Authoritative parents tend to do the following:

- Provide a loving and supportive environment
- Hold high expectations and standards for children's behavior
- Explain why some behaviors are acceptable and others are not
- Consistently enforce reasonable rules for behavior
- Include children in decision making
- Provide age-appropriate opportunities for independence

Chapter 3 discusses the benefits of authoritative parenting from a developmental perspective.

As we explore classroom management strategies in this chapter, we'll often see one or more of these characteristics at work.

We've organized our discussion of preventive classroom management around eight general strategies:

- Create a physical arrangement that helps to focus students' attention on classroom lessons and academic subject matter.
- Establish and maintain good working relationships with students.

- Create a psychological climate in which students feel emotionally safe and are intrinsically motivated to learn.
- Set reasonable limits for behavior.
- Plan activities that keep students on task and productive.
- Regularly monitor what students are doing.
- Modify instructional strategies to promote a positive climate.
- Take developmental differences and student diversity into account in making classroom management decisions.

In the upcoming sections, we'll identify specific ways to implement each of these strategies.

Arranging the Classroom

Teachers have many different preferences for how to arrange seating in their classrooms (Gremmen et al., 2016). Good management begins well before the first day of class. As we arrange desks and chairs, decide where to put materials and equipment, and think about where each student will sit, we should consider the effects that various arrangements are likely to have on students' behavior. For example, we might decide to allow students to choose their own seats, but then we need to be prepared for the fact that students will surely sit near their friends! The following strategies are especially helpful.

- *Arrange furniture in ways that encourage student interaction when it's appropriate and discourage it when it's counterproductive.* In the past, student desks and chairs often were always arranged in tidy rows—an arrangement that is not always conducive to interactive activities. Several clusters of desks and chairs facing one another are useful for small-group work, whereas traditional rows are often more effective in keeping students on task during individual assignments (Carter & Doyle, 2006). And sometimes it may be helpful to arrange desks into a horseshoe configuration, which can be helpful to both keep students focused on the teacher and encourage them to work collaboratively and engage other students in discussion when appropriate (Rogers, 2020). We should be sensitive to cultural differences here: Students who are accustomed to cooperating regularly with peers might find an everyone-faces-the-teacher arrangement strange and unnerving (Lipka, 1994). You may want to plan for flexibility so students can move to different positions for different types of activities.
- *Minimize possible distractions.* Certainly, we want to make our classrooms visually appealing—for example, by putting colorful messages and posters on walls and bulletin boards—but we shouldn't bombard students with so much visual stimulation that they have trouble concentrating on their work. We should also arrange our classrooms in ways that minimize the likelihood of off-task behaviors—for instance, by establishing traffic patterns that allow students to move around the room without disturbing one another and by seating overly chatty friends on opposite sides of the room. If the doors to our classrooms have exposed windows to the hallway, we might consider covering the windows so that students are not distracted by those passing by. We should keep potentially distracting materials out of sight and reach until we need them, and we should always preview all materials to make sure that the content is appropriate (Emmer & Evertson, 2009; Hanley, Khairat et al., 2017; Hanley et al., 2009; Sabers et al., 1991).
- *Arrange the classroom so that it's easy for you to interact with students.* Our arrangement of desks, tables, and chairs should make it easy for us to converse with virtually any student. It's often beneficial to place chronically misbehaving or uninvolved students close at hand: Students seated near us are more likely to pay attention, interact with us, and become actively involved in classroom activities. In addition to rearranging students' seats, we also can move our desks, bookshelves, computer

Place chronically misbehaving or uninvolved students close at hand.

stations, and other furnishings throughout the year when needed (Davis & Thomas, 1989; Strother, 1991; Woolfolk & Brooks, 1985).

- *Identify locations that allow easy monitoring of students' behavior.* As we proceed through various lessons and activities—even when working with an individual or small groups—we should regularly be able to see *all* students (Emmer & Evertson, 2009; Gettinger & Kohler, 2006). By occasionally surveying the classroom for possible signs of confusion, frustration, or boredom, we can more easily detect minor student difficulties and misbehaviors before they develop into serious problems.
- *Make appropriate changes for class wide use of technology.* If students are using laptops or tablets individually, we should arrange furniture *and* position ourselves in ways that enable us to monitor the contents of each student's screen. Also, we should ensure that we can continue to watch students' behavior when we are using classroom technology ourselves.

Establishing and Maintaining Productive Teacher–Student Relationships

Research consistently indicates that the quality of teacher–student relationships is one of the most important factors—perhaps *the* most important factor—affecting students' emotional well-being, motivation, and learning. When students have positive, supportive relationships with teachers, they have more intrinsic motivation to learn, engage in more self-regulated learning, behave more appropriately, are less likely to be influenced by their friends to engage in disruptive behaviors, and achieve at higher levels (Anderman et al., 2009; Berg & Aber, 2015; Hughes, 2011; Hughes et al., 2008; Kincade et al., 2020; Martin & Collie, 2019; Roorda et al. 2011; Rucinski et al., 2018; Sethi & Scales, 2020; Shin & Ryan, 2017; Vitaro et al., 2012).

Although some students may misbehave as a way of gaining our attention (this might be true for Eli, Jake, and Vanessa in the opening case study), in our own experiences as parents, teachers, and school psychologists, we've never met a child or adolescent who, deep down, didn't want to have positive, productive relationships with teachers. In addition, *we* also benefit from having good relationships with our students; indeed, when teachers establish productive relationships with students, we experience more positive emotions and are more engaged ourselves (Klassen et al., 2012).

The following strategies can help teachers maintain productive working relationships with students.

- *Regularly communicate caring and respect for students as individuals.* We can communicate caring and respect through the many little things we do each day (Allday et al., 2011; Allday & Pakurar, 2007; Anderman et al., 2011; Certo et al., 2003). For example, we can give students a smile and warm greeting at the beginning of the day. We can be good listeners when they come to school angry or upset. And we should certainly learn every student's name within the first few days of school. Sometimes having brief conversations with our students outside of our own classrooms can be very meaningful; indeed, research indicates that for adolescents, conversations with adults in non-academic settings (e.g., the hallway, the cafeteria, etc.) are related to fewer negative student behaviors (Cash et al., 2019). One high school student described caring teachers this way:

  > You might see them in the hallway and they ask how you're doing, how was your last report card, is there anything you need. Or, maybe one day you're looking a little upset. They'll pull you to the side and ask you what's wrong, is there anything I can do. (Certo et al., 2002, p. 15)

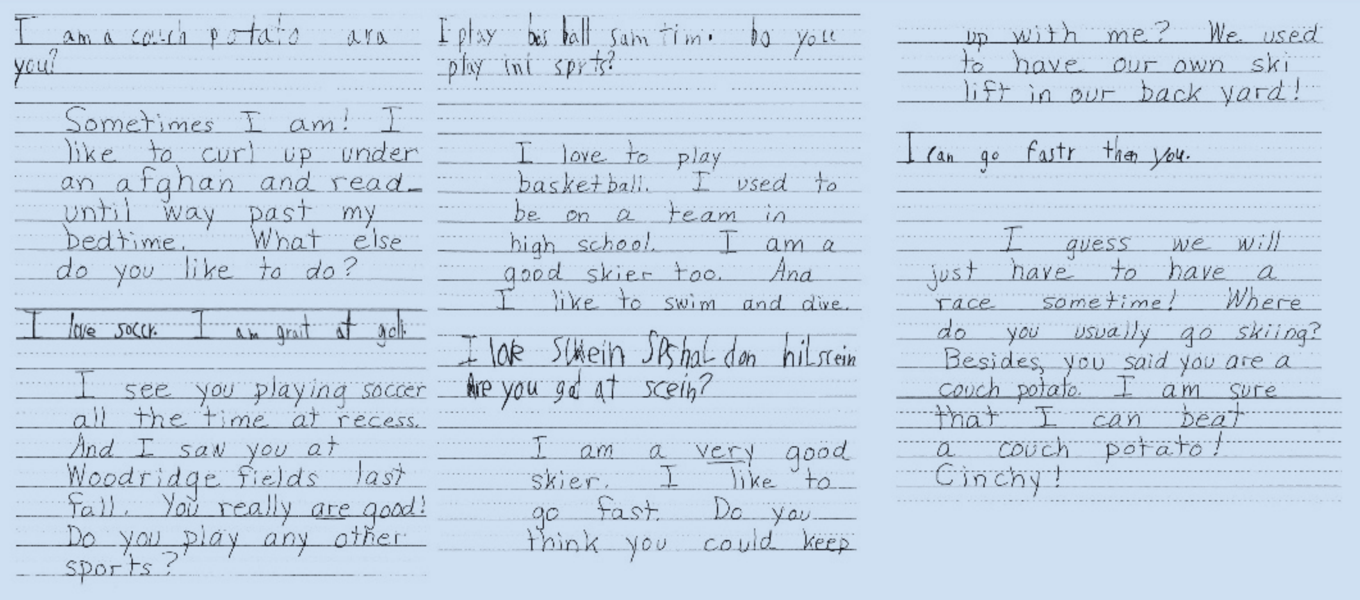
  Such caring gestures can be especially important for students who have few, if any, supportive relationships at home (Juvonen, 2006; O'Connor et al., 2011; Reese et al., 2014).

- *Remember that caring and respect involve much more than just showing affection.* Some beginning teachers erroneously think that good teaching involves little more than showing that they really like their students—in other words, being "warm and fuzzy" (Anderman et al., 2002, p. 274; Goldstein & Lake, 2000; Patrick & Pintrich, 2001). In fact, to show students that we *truly* care about and respect them, we must take steps such as these:
    - Be well prepared for class, and always demonstrate a love of teaching.
    - Communicate high yet realistic expectations for performance and provide the support students need to meet those expectations.
    - Include students in decision making and evaluation of their work.
    - Make every attempt to have substantially more positive than negative interactions with each student.
    - Acknowledge that students can occasionally have an "off" day. (Certo et al., 2003; Chang & Davis, 2009; Davis, 2003; Kincade et al., 2020; Patrick et al., 2011; Wentzel et al., 2010)

Establish mechanisms through which you can communicate regularly and privately with every student.

Another important strategy is to establish means through which students can communicate privately with us. Email or text-messaging can be used for such communication, particularly with adolescent students. A low-tech alternative is a "What's Up?" form on which students might occasionally write and submit information about especially noteworthy or challenging events in their personal lives (Smith, 2009). A third possibility is the use of two-way *dialogue journals,* in which individual students and their teacher both write one or more times each week; these can be traditional paper journals, or online private conversations. Figure 12.1 shows several entries in 6-year-old Matt's journal; each entry is followed by a response (indented) from his first-grade teacher. Notice that Matt feels comfortable enough with his teacher to engage in playful one-upmanship ("I can go faster then you"). Although his writing skills are far from perfect—for instance, he writes *especially downhill skiing* as "spshal don hilscein"—they're certainly adequate to communicate his thoughts. Notice, too, that his teacher doesn't correct his misspellings. Her primary purposes are to encourage him to write and to open the lines of communication; giving negative feedback about spelling here might interfere with both of these goals.

Figure 12.1 Two-way *dialogue journals* provide an effective means of maintaining one-on-one communication with all students. In these excerpts from 6-year-old Matt's journal, Matt and his first-grade teacher discover common outside interests.



I am a couch potato ara you?

Sometimes I am! I like to curl up under an afghan and read until way past my bedtime. What else do you like to do?

I love soccr I am grait at goli

I see you playing soccer all the time at recess. And I saw you at Woodridge fields last fall. You really are good! Do you play any other sports?

I play bes ball sam tim. Do you play ini sprts?

I love to play basketball. I used to be on a team in high school. I am a good skier too. And I like to swim and dive.

I lok Skein Spshal don hilscein Are you gd at scein?

I am a very good skier. I like to go fast. Do you think you could keep up with me? We used to have our own ski lift in our back yard!

I can go fastr then you.

I guess we will just have to have a race sometime! Where do you usually go skiing? Besides, you said you are a couch potato. I am sure that I can beat a couch potato! Cinchy!

Ann Shump

Figure 12.2 As her journal entries show, 8-year-old Olivia initially interpreted her teacher's casual remark to the school nurse in a way very different from the teacher's intended meaning. Fortunately, the teacher corrected the misunderstanding a few days later.

October 22

I went to a new school today. My teacher's name is Mrs. Whaley. I accidentally cracked an egg on my head. Mrs. Whaley told the nurse that I was a showoff and a nuisance. I got really sad and wanted to run away from school, but I didn't leave.

. . .

October 27

We presented our book reports today. I was the last one to present my book report. Whenever I did my book report, they laughed at me, but the teacher said they were laughing with me. I asked the teacher why she had called me a nuisance the first day. And she said, "Olivia, I didn't call you a nuisance. I was saying to Mrs. Larson that it was a nuisance to try to wash egg out of your hair." I was so happy. I decided to like Mrs. Whaley again.

- *Work hard to improve relationships that have gotten off to a bad start.* Occasionally, students may come to us with an apparent chip on the shoulder, distrusting us from the start because of previous hurtful relationships with other adults (Davis, 2003; Hyman et al., 2006; Pianta, 1999). At other times we may get relationships off to a bad start through our own actions—perhaps because we've incorrectly attributed low achievement to lack of effort rather than lack of skill or perhaps because we've accused a temperamentally high-energy child of being intentionally disobedient (Chang & Davis, 2009; Keogh, 2003; Silverberg, 2003). Occasionally, too, students might misinterpret something we say or do. For example, the first day that 8-year-old Olivia attended third grade at a new school, she accidentally got egg in her hair. Her teacher, Mrs. Whaley, took her to the nurse's office to have the egg washed out. As revealed in the journal entries in Figure 12.2, Olivia initially misinterpreted Mrs. Whaley's comment about the situation. Not until five days later did she gain a more accurate understanding of what Mrs. Whaley had said.

Unfortunately, students who have the poorest relationships with their teachers are often those most in need of good ones (Juvonen, 2006; Stipek & Miles, 2008; Wentzel et al., 2009). Thus, regardless of the causes of nonproductive relationships, we must work hard to turn them into productive ones. The first step, of course, is to *identify* nonproductive relationships, recognizing signs such as these:

- We have adverse feelings (e.g., dislike, anger) toward a student.
- We rarely interact with a student.
- Our messages to a student usually involve criticism or fault finding.
- We have a sense of learned helplessness about our ability to work effectively with a student. (Houts et al., 2010; Pianta, 1999; Sutherland & Morgan, 2003)

Once we've identified troublesome relationships, several strategies can help us repair them:

- Meet one on one with a student to talk openly about the problem and possible ways to fix it (more on this point later in the chapter).
- Consult with a school counselor or school psychologist to get advice on how to improve the relationship.
- Think actively—perhaps in a brainstorming session with one or more colleagues—about alternative explanations for bad behavior, and about potential solutions.
- Spend time with a student in a relaxed context—perhaps just chatting before or after school—that can allow more positive feelings to emerge. (Chang & Davis, 2009; Pianta, 1999, 2006; Silverberg, 2003; Sutton & Wheatley, 2003)

Creating an Effective Psychological Climate

Caring and supportive teacher–student relationships are important contributors to the overall **classroom climate**—the general psychological environment that permeates classroom interactions. Ultimately, we want a classroom in which students feel safe and secure, make learning a high priority, and are willing to take the academic risks and make the mistakes so critical for learning (Hamre & Pianta, 2005; Hattie & Gan, 2011). When classroom climates are positive and students are engaged with their work, disciplinary problems are less likely to occur. This seems to be especially important for students at risk for academic failure and dropping out of school (Gregory et al., 2010;

Lee & Burkam, 2003; Pianta, 1999). Following are several strategies that you can use to promote a positive classroom climate:

- *Establish a goal-oriented, businesslike, yet nonthreatening atmosphere.* We and our students must all recognize that we're in school to get certain things accomplished (Davis & Thomas, 1989). Despite our emphasis on business, the classroom atmosphere should never be uncomfortable or threatening, because students who are excessively anxious are unlikely to give us their best (Cassady, 2010; Sapolsky, 2005). Strategies such as these enable us to be businesslike without being threatening:

  Chapter 11 discusses the potential adverse effects of anxiety.

    - Hold students accountable for achieving instructional objectives but without placing them under continual surveillance.
    - Plan tasks that are interesting and engaging—occasionally even exhilarating—rather than tedious and boring. When you are planning an activity, you might want to ask yourself, "If I was one of my students, would I find this activity interesting or engaging?" However, entertainment and excitement shouldn't be goals in and of themselves. Rather, they're means to a more important goal: mastering academic content.
    - Point out students' errors and misconceptions within the context of messages that highlight their strengths (e.g., inquisitiveness, critical thinking skills) and ongoing progress; when we point out errors, we should also suggest alternative strategies so that students don't make attributions to low ability.
    - Admonish students for misbehavior without holding grudges against them. (Fletcher & Cassady, 2010; Narciss, 2008; Rogers, 1983; Spaulding, 1992)
- *Communicate and demonstrate that school tasks and academic subject matter have value.* As teachers, we give students messages about the value of school subject matter by both what we say and what we do (Anderman et al., 2011; Brophy, 2008; Doyle, 1983). For example, if we ask students to spend hours each day engaged in what seems like meaningless busy work and if we assess learning primarily through tests that encourage rote memorization, we're indirectly telling students that classroom tasks are merely things that need to be "gotten over with" (Hiebert & Raphael, 1996; Stodolsky et al., 1991). Furthermore, if we continually focus students' attention on performance goals—how their achievement compares to that of others—we may increase their anxiety and also indirectly increase the frequency of disruptive behavior (Kumar et al., 2002; Marachi et al. 2001; Patrick et al., 2011). If, instead, we continually communicate that the content we are teaching can help students make better sense of the world, if we assess learning in ways that require meaningful learning, and if we focus on how well each student is *improving* over time, we show students that mastering the content can potentially enhance the quality of their lives (Pugh, et al., 2010).

  Chapter 10 discusses strategies for communicating the value of academic tasks to students.
- *Give students some control over classroom activities.* To make sure students accomplish instructional goals, we must direct the course of classroom activities to some degree. Nevertheless, we can give students control over some aspects of classroom life—for example, through strategies such as these:
    - Create a regular routine for completing assignments, enabling students to do them with only minimal guidance.
    - Allow students to set their own deadlines for some assignments, enabling them to establish a manageable schedule.
    - Occasionally let students choose how to accomplish certain instructional goals and objectives, enabling them to set some of their own priorities. (Patall et al., 2010; Spaulding, 1992)

  Chapter 10 discusses the importance of giving students a sense of autonomy.

Through such strategies, we promote the sense of autonomy so important for intrinsic motivation, along with the development of self-regulation skills essential for students' long-term academic success.

- *Promote a general sense of community and belongingness.* An increasingly popular instructional approach is to create a *community of learners*, a classroom in which one or more teachers and their students collaborate to build a body of knowledge and help one another learn. Ultimately, we also want to create a general **sense of community** in the classroom—a sense that we and our students have shared goals, are mutually respectful and supportive of one another's efforts, and believe that everyone makes an important contribution to classroom learning (Ciani et al., 2010; Hom & Battistich, 1995; Osterman, 2000). Creating a sense of community engenders feelings of **belongingness**: Students see themselves as important and valued members of the classroom (Anderman, 2002; Anderman & Freeman, 2004; Ellis et al., 2010).

When students share a sense of community, they're more likely to exhibit prosocial behavior, stay on task, be enthusiastic about classroom activities, and achieve at high levels. Furthermore, a sense of classroom community is associated with lower rates of emotional distress, disruptive classroom behavior, truancy, and dropping out (Hom & Battistich, 1995; Juvonen, 2006; Osterman, 2000; Patrick et al., 2007). And consistent experiences with caring and equitable classroom communities help students internalize attitudes essential for a successful democratic society, including a commitment to fairness and justice for everyone (Flanagan et al., 2007).

You can learn more about communities of learners in Chapter 9.

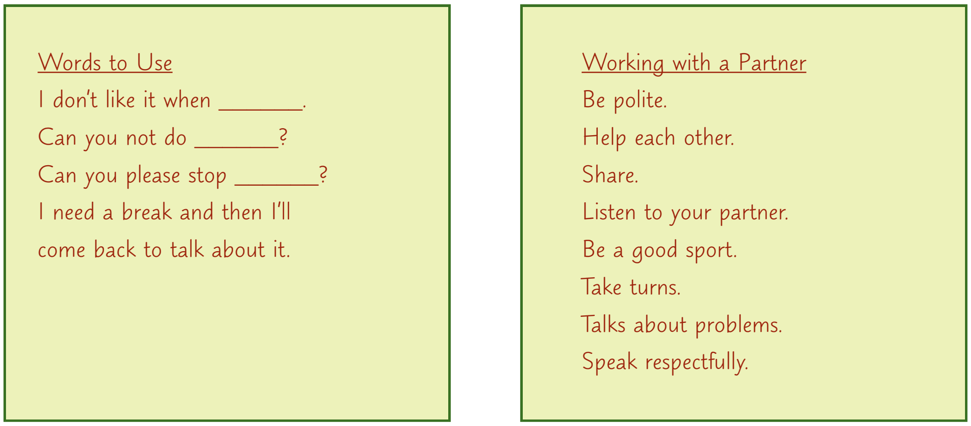
Create a sense of shared goals, interpersonal respect, and mutual support.

Refuse to tolerate statements or behaviors that show lack of concern or respect for other class members.

Perhaps the most important characteristic of a sense of classroom community is that students always treat one another with kindness and respect. Even when students must take issue with something that one of their classmates has said or done, they can do so tactfully and respectfully (e.g., see Figure 12.3). When classmates *aren't* kind and respectful—for example, when they ridicule or bully certain other class members—their victims are apt to withdraw either physically or mentally from classroom activities (Swearer et al., 2010).

We also need to promote feelings of belonging at the school level. When students are in middle school or high school, they may feel a sense of belonging in one class, but not in another. But students can still feel an overall sense of belonging in a school, particularly if they feel safe, have a supportive group of friends, and are engaged in the academic, social, or athletic communities within the school. When students feel a sense of school belonging, they are more likely to achieve at higher levels, feel efficacious about learning, and experience psychological well-being (Anderman, 2002; Chipuer et al., 2003; Gillen-O'Neel & Fuligni, 2013; McMahon et al., 2009). Feelings of belonging at school are particularly important for ethnically diverse students (Gray et al., 2018). In fact, although on average Black students are more likely to be disciplined in school than are White students, the likelihood of a Black student being suspended from school is significantly

Figure 12.3 Especially in the elementary grades, many students benefit from visual reminders about how to interact with classmates, as illustrated in these two posters displayed in a second-grade classroom.



Words to Use
I don't like it when ________.
Can you not do ________?
Can you please stop ________?
I need a break and then I'll
come back to talk about it.

Working with a Partner
Be polite.
Help each other.
Share.
Listen to your partner.
Be a good sport.
Take turns.
Talks about problems.
Speak respectfully.

lower in schools in which Black students feel a strong sense of school belonging (Bottiani et al., 2017).

As teachers, we must make it clear that remarks or behaviors that deride or denigrate other class members are *totally unacceptable* both inside and outside the classroom. The Creating a Productive Classroom Environment feature "Creating and Enhancing a Sense of Classroom Community" offers several strategies that can enhance students' sense that they're important and valued members of the classroom.

See Chapter 3 for a discussion of socialization as an important factor in children's development.

Creating a Productive Classroom Environment

Creating and Enhancing a Sense of Classroom Community

- **Consistently communicate the message that all students deserve the respect of their classmates and are important members of the classroom community.**

  A middle school language arts class has three students with reading disabilities. The teacher doesn't publicly identify the students with disabilities, because doing so would violate their right to confidentiality about their conditions. However, she frequently communicates the message that students at any grade level vary widely in their literacy skills—usually through no fault of their own—and continually stresses that it's the class's responsibility to help *everyone* improve their literacy skills.

- **Create mechanisms through which students can all help to make the class run smoothly and efficiently.**

  A kindergarten teacher creates several "helper" roles (e.g., distributing art supplies, feeding the goldfish); he develops a tracking system to make sure he assigns roles to different students on a rotating basis.

- **Emphasize such prosocial values as sharing and cooperation, and provide opportunities for students to help one another.**

  As students work on in-class assignments, a seventh-grade math teacher often asks, "Who has a problem that someone else might be able to help you solve?"

- **Make frequent use of interactive and collaborative teaching strategies.**

  In assigning students to work in small groups, a high school social studies teacher usually puts a student with poor social skills in a group with two or three more socially proficient students. Before the groups begin their work, the teacher reminds students of the class's rules for group work, such as "Listen to others politely and attentively" and "Address differences of opinion in respectful and constructive ways."

- **Solicit students' ideas and opinions, and incorporate them into class discussions and activities.**

  A first-grade teacher regularly has students vote on the storybook she should read during "settling-down" time after lunch each day. She first reads the book that gets the most votes, but she assures students who voted differently that she'll read their choices later in the week, saying, "It's important that everyone has a say in what we read."

- **Use competition only to create an occasional sense of playfulness in the class and only when all students have an equal chance of winning.**

  A high school Spanish teacher assigns a long-term cooperative group project in which students write and then create videos for Spanish soap operas (*telenovelas*). A few weeks later the teacher holds an "Academy Awards Banquet"—a potluck dinner for the students and their families. At the banquet, the teacher shows all the videos and awards a variety of "Oscars." She gives every group an Oscar for some aspect of their performance.

- **Encourage students to be on the lookout for classmates on the periphery of ongoing activities—perhaps students with disabilities—and to ask these students to join in.**

  Teachers at an elementary school all adhere to and enforce the same *no-exclusion* policy on the playground: Any student who wants to be involved in a play activity *can* be involved.

- **Work on social skills with students whose interpersonal behaviors may victimize or alienate others.**

  A third grader often behaves aggressively toward classmates who have something she wants. For example, when waiting for her turn at the computer, she may yell "I need to use it now!" or, instead, shove its current user out of the chair. In a private conference, her teacher points out the importance of patience and turn taking and suggests several ways she might politely make her needs known (e.g., "When might you be finished with the computer? Can I use it after you're done?"). The teacher also has the student practice the strategies in various role-playing scenarios.

SOURCES: Ames, 1984; Chang & Davis, 2009; Evertson & Emmer, 2009; Hamovitch, 2007; Kim et al., 1995; Lickona, 1991; Osterman, 2000; Ryan & Patrick, 2001; Sapon-Shevin et al., 1998 (playground example); Stipek, 1996; Turnbull et al., 2000; Wang & Holcombe, 2010; Wentzel et al., 2010.

Setting Limits

In the opening case, Ms. Cornell failed to provide guidelines for how students should behave—something she should have done as soon as the school year began. Students must know that certain behaviors won't be tolerated, especially those that cause physical or psychological harm, damage property, or interfere with others' learning. Over the long run, setting reasonable limits on classroom behavior helps students become productive members of adult society.

As we set limits, we must remember that students are more likely to be intrinsically motivated to master subject matter if we preserve their sense of autonomy. With this caution in mind, we offer the following recommendations.

- *Establish a few rules and procedures at the beginning of the year.* Effective classroom managers establish and communicate rules and procedures right from the start. For example, they identify acceptable and unacceptable behaviors and describe the consequences of noncompliance. They develop consistent procedures and routines for such things as completing seatwork and turning in assignments. They have procedures in place for non-routine events such as assemblies and fire drills. They have clear policies about the use of cell phones and other handheld devices. Taking time to clarify rules and procedures seems to be especially important in the early elementary grades, when students may not be familiar with how things are typically done at school (Carter & Doyle, 2006; Doyle, 1990; Gettinger & Kohler, 2006; Lane et al., 2011).

  Ideally, students should understand that rules and procedures aren't based on our personal whims but are, instead, designed to help the class run smoothly. One way of promoting such understanding is to include students in decision making about the rules and procedures. By incorporating students' ideas and listening to their concerns about the limits we set, we help them understand the reasons for—and also enhance their sense of ownership of—those limits (Evertson & Emmer, 2009; Fuller, 2001; Watson, 2008).

  Keep in mind that rules and procedures are easier to remember—and therefore easier to follow—if they're relatively simple and few in number (Doyle, 1986; Emmer & Gerwels, 2006; Lane et al., 2011). Effective classroom managers tend to stress only the most important rules and procedures at the beginning of the school year and introduce additional rules and procedures as needed later. Potentially serious behavioral infractions such as bullying occur less often in classrooms where teachers have just a few (often strict) rules that are enforced fairly, and where teachers also maintain positive relationships with their students (Cornell et al., 2015). Figure 12.4 is an example of an easy-to-remember acronym that a high school teacher developed. You should also keep in mind that although some order and predictability is essential for student productivity, *too much* order can make a classroom a routine, boring place—one without any element of fun and spontaneity. We don't necessarily need rules and procedures for everything!

Refer to Chapter 10 for a reminder about the benefits of informational versus controlling messages.

- *Present rules and procedures in an informational rather than controlling manner.* We're more likely to maintain students' sense of autonomy if we present rules and procedures as items of information rather than as forms of control (Deci, 1992; Koestner et al., 1984; Reeve, 2009). This will require some planning and forethought, but it is well worth the effort; we naturally think about rules and procedures in terms of controlling students, but we need to carefully balance behavior management with engagement and motivation. Figure 12.5 provides several examples of rules and procedures presented in an informational manner. Each of these statements includes the reasons for imposing certain guidelines—a strategy that's likely to increase students' compliance.

Figure 12.4 After a year of dealing with many behavioral problems, a new high school teacher developed this acronym to help students remember his class rules.

"Remember, there is no SOOT allowed in our class!"
S = speaking out of turn or during quiet time
O = out of seat
O = other work
T = tardy

Figure 12.5 We are more likely to motivate students to follow classroom rules and procedures if we communicate those rules and procedures as information *without* conveying a desire to impose a lot of control.

We might say this (as information) . . .	Rather than this (as control)
"You'll finish your independent assignments sooner if you get right to work."	"Please be quiet and do your own work."
"As we practice for our fire drill, it's important to line up quickly and quietly so that we can hear the instructions we're given and will know what to do."	"When the fire alarm sounds, line up quickly and quietly, and then wait for further instructions."
"This assignment can help you develop the writing skills you'll need after you graduate. It's unfair to other authors to copy their work word for word, so we'll practice putting ideas into our own words and giving credit to authors whose ideas we borrow. Passing off another's writing as your own can lead to suspension in college or a lawsuit in the business world."	"Cheating and plagiarism are not acceptable in this classroom."
"Everyone needs to be in their seats when the bell rings at the start of class. There is a lot going on at the start of class, and when you are in your seats, you can get started on your work right away, and I can take attendance quickly. Then we'll get much more accomplished during class, and you'll be less likely to have homework."	"When the bell rings, you need to be seated and quiet."

The following scenario provides a simple illustration of how giving a reason can make a noticeable difference:

> Gerard has little tolerance for frustration. Whenever he asks Ms. Donnelly for assistance, he wants it *now*. If she can't immediately help him, he screams, "You're no good!" or "You don't care!" and shoves other students' desks as he angrily walks back to his seat.
>
> At one point during the school year, the class is working on a unit on interpersonal skills. One lesson addresses *timing*—the most appropriate and effective time to ask for someone's assistance. A week later, Gerard approaches Ms. Donnelly for help with a math problem. She is working with another student but briefly turns to Gerard and says, "Timing." She expects the usual screaming, but instead he responds, "Hey, Ms. D., I get it! I can ask you at another time!" He returns to his seat with a smile. (Based on Sullivan-DeCarlo et al., 1998, p. 81)

When it's necessary to change classroom rules and procedures, try to include students in the decision making.

- *Periodically review the usefulness of existing rules and procedures.* As the year progresses, we may discover that some rules and procedures need revision. For example, we may find that rules about when students can move around the room are overly restrictive or that procedures for turning in homework don't accommodate students who must leave class early for doctors' appointments or certain extracurricular events.

  Regularly scheduled class meetings provide one mechanism through which we and our students can periodically review classroom rules and procedures (Campbell, 1996; Glasser, 1969; Striepling-Goldstein, 2004). Consider this scenario as an example:

> Every Friday afternoon, Ms. Ayotte's students move their chairs into a circle for their weekly class meeting. First on the agenda is a review of the past week's successes, including both academic achievements and socially productive events. Next, the group identifies problems that have emerged during the week and brainstorms ways to avert such problems in the future. Finally,

You can learn more about the nature and benefits of moral dilemmas in Chapter 3.

the students consider whether existing rules and procedures are serving their purpose, and, if not, the group either modifies existing rules and procedures or establishes new ones. During the first few meetings, Ms. Ayotte leads the discussions, but once students have become familiar and comfortable with the process, she relinquishes control of the meetings to her students on a rotating basis.

By providing frequent opportunities for students to review classroom policies, we find another way of giving them a sense of ownership of the policies. Furthermore, more advanced moral reasoning may gradually emerge, perhaps as a result of occasional moral dilemmas with which students must wrestle (Milner, 2006; Nucci, 2006, 2009; Power et al., 1989).

- *Acknowledge students' feelings about requirements.* There will be times when we must ask students to do things they would prefer not to do. Rather than pretend that students are eager to do what we've asked, we're better advised to acknowledge their displeasure and lack of motivation. For example, we might tell students that we know how difficult it can be to sit quietly during an assembly or to spend an entire evening on a particular assignment. At the same time, we can explain that the behaviors we're requesting of them can help them achieve their own long-term goals. By acknowledging students' feelings about tasks they'd rather not do but also pointing out the benefits, we increase the likelihood that students will willingly comply (Jang et al., 2010; Reeve, 2009).
- *Enforce rules consistently and equitably.* Classroom rules are likely to be effective only if they're consistently enforced. Let's see how this works.

Experiencing Firsthand

Inconsistent Rules

Imagine that you are employed as a cashier at the local supermarket. During training, you are told that the store's policy is that cashiers should not converse with other cashiers while on duty, even if there are no customers in line. Nevertheless, when the store is not crowded and there are no customers at the registers, you occasionally chat quietly with the cashier who is situated at the next register. Your manager always comes over to you when she sees you chatting, and says "You need to focus on your workstation; please do not talk to the other cashiers, even when no customers are present. You know the rules." However, you notice that another cashier, Lee, often has conversations with other cashiers; the manager occasionally reprimands Lee for having these conversations, but more often than not, she ignores Lee's conversations, and does not intervene.

How does this make you feel?

You probably feel somewhat frustrated (and perhaps a bit angry) that the manager does not consistently enforce the "no talking" policy with Lee but does with you. This is how students in your classroom will feel if you enforce rules inconsistently. Rules are only effective if they are enforced fairly and consistently. In the opening case study, Ms. Cornell imposes no consequences when her three troublesome students misbehave. Not only do their antics continue, but other students follow suit, realizing that "anything goes" in Ms. Cornell's classroom. As social cognitive theorists have pointed out, imposing no adverse consequence for inappropriate behavior—especially when that consequence has been spelled out in advance—can actually be a form of *reinforcement* for the misbehavior (Bandura, 1986).

Consistency in enforcing classroom rules should apply not only across occasions but also across *students*. As teachers, sometimes we may like some students more than others, but we must keep our preferences to ourselves. Students can be quite resentful of teachers who grant special favors to and overlook the rule infractions of a few favorite students (Babad, 1995; Babad et al., 2003; Baker, 1999). And students who are unfairly accused or punished are, of course, even more resentful, as one high school student explains:

> Because like if you had a past record or whatever like in middle school if you got in trouble like at all, they would think that you're a slight trouble maker and if you got in trouble again, they would always . . . if you were anywhere that something bad happened or something against the rules or whatever, they pick you first because they think that you have a past. So they wouldn't like pick the kids that had never done anything (Certo et al., 2002, p. 25).

Thus, consistency and equitable treatment for all students—or the lack thereof—have a significant effect on teacher–student relationships and overall classroom climate (Babad et al., 2003; Peter & Dalbert, 2010; Wentzel et al., 2010).

Chapters 10 and 11 presents strategies for motivating students to learn and achieve.

Planning Activities that Keep Students on Task

As effective teachers plan their lessons, they think not only about how to facilitate learning, but also about how to keep students consistently on task. Recall the discussion in Chapter 11 about engagement—when students are engaged with their work, they are less likely to be distracted and potentially misbehave. And when they maintain their engagement, they learn more.

Optimal learning occurs when we provide both ample time for students to engage in academic tasks and an organized, responsive, and supportive environment (Connor et al., 2014). Certainly, a key strategy is to motivate students to *want* to master classroom subject matter, but experienced educators have offered several other suggestions as well:

- *Make sure students are always productively engaged in worthwhile activities.* All humans have a basic *need for arousal*—a need for some degree of physical or cognitive stimulation. At school, students should find their stimulation in ongoing tasks and activities. If, instead, they have a lot of free time on their hands, they'll generate stimulation of their own, sometimes in the form of misbehaviors.

  Effective classroom managers make sure that there's little unscheduled time when there is nothing going on. Following are several strategies for keeping students productively engaged:

  - Have specific activities for students to do each day, even on the first day of class.
  - Have materials organized and equipment set up before class.
  - Plan activities that ensure *all* students' involvement and participation.
  - Maintain a brisk pace throughout each lesson, but without moving so quickly that students can't keep up.
  - Present advance organizers at the beginning of each day or class period. Specifically, list the day's activities, and, when possible, the time allocated for each (although sometimes you will want to allow for flexibility if an activity may take longer than planned). Briefly review the accomplishments at the end of the day or the class period.
  - Ensure that students' comments are relevant and helpful but not excessively long winded. For example, take chronic time-monopolizers aside for private discussions about giving classmates a chance to speak.
  - Spend only short periods of class time assisting individual students unless other students are capable of working independently in the meantime.
  - Ensure that students who finish an assigned task quickly have something else to do (e.g., reading a book, writing in a class journal). (Doyle, 1986; Emmer & Evertson, 2009; Emmer & Gerwels, 2006; Gettinger, 1988; Lane et al., 2011; Munn et al., 1990)

See Chapter 2 for a review of Vygotsky's notion of the zone of proximal development, which has implications for providing somewhat challenging tasks when students are working collaboratively with others.

- *Choose tasks at an appropriate difficulty level for students' knowledge and skills.* Students are more likely to work diligently when they have activities and assignments appropriate for their current knowledge and skills—this may include challenging tasks, but the challenges need to be reasonable and teachers need to provide appropriate scaffolding so that students can experience success (Mac Iver et al., 1995; Moore & Edwards, 2003; Robinson & Griesemer, 2006). They're apt to misbehave when they're asked to do things that they perceive—either accurately or not—to be exceptionally difficult. Hence, classroom misbehaviors are more often observed with students who have a history of struggling in their schoolwork (W. Doyle, 1986; Miles & Stipek, 2006). In the opening case study, Eli, Jake, and Vanessa may very well have such a history of failure.

  Avoiding overly difficult tasks *doesn't* mean that we should plan activities so easy that students aren't challenged and learn nothing new. One strategy is to *begin* the school year with relatively easy tasks that students can readily complete. Such tasks enable students to practice normal classroom routines and procedures and gain a sense that they can succeed in and enjoy classroom activities. Once we've established a supportive classroom climate and made students comfortable with our procedures, we can gradually introduce more difficult and challenging assignments (Doyle, 1990; Emmer & Evertson, 2009).

Begin the school year with easy and familiar tasks, introducing more difficult ones after a supportive classroom climate has been firmly established.

- *Provide some structure for activities and assignments.* As an example of how important structure can be, try the following exercise.

Experiencing Firsthand

Pop Quiz

Complete these two tasks either on paper or on your computer:

- **Task A:** Using single words or short phrases, list six characteristics of an effective teacher.
- **Task B:** Explain the general effects of school attendance on children's lives.

Don't read further until you've either (1) completed each task or (2) spent at least five minutes on it.

Once you've tackled the two tasks, answer each of the following questions:

1. For which task did you have a better understanding of what you were being asked to do?
2. During which task did your mind more frequently wander to irrelevant topics?
3. During which task did you engage in more off-task behaviors—perhaps looking around the room, doodling, or getting out of your seat?

We're guessing that you found the first task relatively straightforward, whereas the second wasn't at all clear. Did the ambiguity of Task B lead to more irrelevant thoughts and off-task behaviors? Off-task behavior occurs more frequently when activities are so loosely structured that students don't have a clear sense of what they're supposed to do.

Effective teachers tend to give assignments with some degree of structure—not only sufficient scaffolding to support learning but also clear guidance about how to proceed, especially during the first few weeks of school (Doyle, 1990; Evertson & Emmer, 1982; Gettinger & Kohler, 2006). However, we need to strike a happy medium here: We don't want to structure tasks to the point that they require only basic skills and never allow students to make decisions. In addition to keeping students on task, we also want them to have a sense of autonomy, practice self-regulation skills, and develop and use complex cognitive processes—for example, to think analytically, critically, and creatively (Doyle, 1986; Nichols, 2004; Weinert & Helmke, 1995).

- *Plan for transition times in the school day.* In the opening case study, Eli, Jake, and Vanessa often misbehave at the beginning and end of the school day, as well as before and after recess and lunch. Misbehaviors occur most frequently during transition times—as students end one activity and begin a second or as they move from one classroom to another. Effective classroom managers take steps to ensure that transitions proceed quickly and without a loss of momentum (Doyle, 1984; Gettinger & Kohler, 2006). For example, they establish procedures for moving from one activity to the next, and they ensure that there's little slack time in which students have nothing to do. If such procedures are implemented consistently at the beginning of the school year, students usually will internalize them and adhere to them throughout the year. In order to make this happen, early in the year teachers need to be particularly attentive to what their students are doing during transitions, and to redirect them as appropriate. Recall the "**advance organizer**" that we suggested having available for students daily; such organizers can be used to facilitate transitions when they are used daily and consistently. Especially in the secondary grades, when students change classes every hour or so, effective classroom managers typically have a task for students to complete as soon as they enter the classroom. Consider these examples:
  - An elementary school teacher has students follow the same procedure each day as lunchtime approaches: (1) Place completed assignments in the teacher's "In" basket, (2) put away supplies, (3) get out any home-packed lunches, and (4) line up quietly by the door.
  - A middle school math teacher has students copy the night's homework assignment as soon as they come into class.
  - As students first enter the classroom, a middle school social studies teacher always hands them a short "Do It Now" assignment. For example, on one occasion he hands out a map of U.S. states and state capitals and instructs students to identify place names that might have Native American names and those that probably have European roots—a task that leads to a class discussion on the origins of place names.
  - Before each class period begins, a ninth-grade creative writing teacher writes a topic or question on the board (e.g., "My biggest pet peeve"). Students know that when they come to class, they should immediately begin to write on the topic or question of the day.
  - A high school physical education teacher has students begin each class session with five minutes of stretching. The teacher has posters on the walls of the gym to remind students of proper stretching techniques.

  Although very different in nature, all of these strategies share the common goal of keeping students focused on productive behaviors. When such strategies are used consistently, behavior problems are less likely to emerge.

  Some students may have considerable trouble moving from one activity to another, especially if they're deeply engaged in what they're doing. Accordingly, it's often helpful to give students advance warning that a transition is coming, describe for them what the subsequent activity will be, and remind them of the usual procedures for switching from one task to another (Carter & Doyle, 2006; Emmer & Gerwels, 2006).

Monitoring What Students Are Doing

Effective teachers communicate something called **withitness**: They know—and their students *know* that they know—what students are doing at all times. These teachers regularly scan the classroom and make frequent eye contact with individual students. They know what misbehaviors are occurring *when* those misbehaviors occur, and they know who the perpetrators are. When we demonstrate withitness, especially at the beginning of the school year, students are more likely to stay on task and display appropriate classroom behavior. Not surprisingly, they're also more likely to achieve at high levels (Gettinger & Kohler, 2006; Hogan et al., 2003; Kounin, 1970; Vollet et al., 2017). It may seem difficult to develop a sense of "withitness" in busy classrooms; this takes time and practice. Making videos of yourself during student teaching experiences and later classroom sessions and then analyzing those videos is an effective way to develop this important skill (Snoeyink, 2010).

Continually monitor what students are doing, and let students know that *you* know what's going on in your classroom.

Modifying Instructional Strategies to Promote a Positive Climate

Consider whether instructional strategies or classroom assignments might be partly to blame for off-task behaviors.

As should now be clear, principles of effective classroom management go hand in hand with principles of learning and motivation. When students are learning and achieving successfully and when they clearly want to pursue the class's instructional goals, they're apt to be busily engaged in productive activities. In contrast, when students have trouble understanding the content or little interest in learning it, they're likely to exhibit the nonproductive or counterproductive behaviors that result from frustration or boredom (Doyle, 1990; Pekrun et al., 2010).

When students misbehave, beginning teachers often think about what the students are doing wrong. In contrast, experienced teachers are more apt to think about what *they* could do differently to keep students on task, and they modify their plans accordingly (Emmer & Stough, 2001; Sabers et al., 1991; Swanson et al., 1990). Thus, when behavior problems arise, we should think as the experts do, considering questions such as these:

- How can I change my instructional strategies to stimulate students' interest?
- Are instructional materials so difficult or unstructured that students are getting frustrated? Alternatively, are they so easy or routine that students are bored?
- What are students really concerned about? For example, are they more concerned about interacting with peers than in gaining new knowledge and skills? How can I address students' motives and goals while simultaneously helping them achieve classroom objectives?
- Are students' problem behaviors being reinforced socially? In other words, is a student misbehaving because she garners attention from others?

Answering such questions enables us to focus our efforts on our ultimate goal: helping students *learn*.

TARGETS: A Mnemonic for Remembering Motivational Strategies that Promote Positive Classroom Behavior Probably the best way to prevent behavioral problems from emerging is to keep your students actively engaged in their work. There are many strategies for enhancing students' motivation, but they can be summed up in seven words or phrases: task, autonomy, recognition, grouping, evaluation, time, and social support (Anderman & Anderman, 2009; Epstein, 1989; Maehr & Anderman, 1993). This multifaceted TARGETS approach to motivation and engagement is presented in Table 12.1. If you look closely at the entries in the table, you'll find that they reflect many of the concepts we've addressed in the preceding sections. And especially if you look at column 2, you'll be convinced, as we are, that teachers clearly *can* make a difference—in fact, a very sizable one—in keeping students engaged in productive classroom tasks. And when they are engaged, they are less likely to misbehave as well.

PRINCIPLES/ASSUMPTIONS

Table 12.1 Seven "TARGET" Principles of Motivation

Principle	Educational Implications	Example
TASK **Classroom tasks affect motivation.**	Introduce new topics through tasks that students find interesting and engaging. Encourage meaningful rather than rote learning. Relate activities to students' lives and goals. Provide sufficient support to enable students to be successful. Help parents to see how classroom tasks will be useful for their children's future academic success and careers.	Ask students to conduct a scientific investigation about an issue that concerns them.
AUTONOMY **The amount of autonomy students have affects motivation, especially intrinsic motivation.**	Give students some choice about what and how they learn. Solicit students' opinions about practices and policies. Have students take leadership roles in some activities. • Include activities or discussions in which multiple opinions or approaches are equally valid.	Let students choose among several ways of accomplishing an instructional goal, being sure that each choice offers sufficient scaffolding to make success likely.
RECOGNITION **The amount and nature of the recognition students receive affect motivation.**	Acknowledge not only academic successes but also personal and social successes. Commend students for improvement as well as for mastery. Provide concrete reinforcers for achievement only when students are not intrinsically motivated. Show students how their own efforts and strategies are directly responsible for their successes.	Have students keep a private record of their progress with learning vocabulary lists and commend those who have demonstrated improvement.
GROUPING **The grouping procedures in the classroom affect motivation.**	Implement a range of participation structures, including individual, whole-class, and small-group activities (e.g., cooperative learning activities, peer tutoring). Plan small-group activities in which all students can make significant contributions. Teach the social skills that students need to interact effectively with peers. Keep grouping flexible; group by ability only if you have a good reason for doing so.	Have students work in small, mixed-ability groups to tackle a challenging issue or problem for which there are two or more legitimate solutions.
EVALUATION **The forms of evaluation in the classroom affect motivation.**	Make evaluation criteria clear; specify them in advance. Minimize or eliminate competition for grades (e.g., don't grade on a curve). Give specific feedback about what students are doing well. Give concrete suggestions about how students can improve. Teach students how to evaluate their own work.	Give students concrete criteria with which they can evaluate the quality of their own writing.
TIME **How teachers schedule time affects motivation.**	Give students enough time to achieve mastery of topics and skills. Include variety in the school day (e.g., intersperse high-energy activities among more sedentary ones). Include opportunities for independent learning.	After explaining a new concept, allocate sufficient time for students to work through a hands-on activity that lets them explore the concept in depth.
SOCIAL SUPPORT **The amount of social support students believe they have in the classroom affects motivation.**	Promote an atmosphere of caring, respect, and support among all class members. Convey liking and respect for every student, along with a genuine eagerness to help every student succeed. Create situations in which all students feel comfortable participating actively (including students who are shy, students who have limited academic skills, students who have physical disabilities, etc.).	When working with students who seem chronically disengaged from lessons, make a particular effort to get to know them individually and monitor their interactions with their peers.

SOURCES: Anderman & Anderman, 2009; Anderman et al., 2011; Anderman et al., 2002; Epstein, 1989; Maehr & Anderman, 1993; Patrick et al., 1997.

Taking Developmental Differences into Account

Our students' age levels must influence our classroom management decisions. Behavior management is important for students of all ages, even those in preschool (Bulotsky-Shearer et al., 2012). Many children in the early elementary grades haven't had enough experience with formal education to know all the unspoken rules that govern classroom interactions: Students should remain silent when a teacher or other adult is talking, only the student who is called on should answer a question, and so on (Mehan, 1979; Payne, 2005). In addition, children just beginning kindergarten or first grade may find their new school environment to be unsettling and anxiety arousing, as do many adolescents making the transition to middle school or high school. And children's social skills—which affect their ability to interact effectively with others—continue to develop with age. Table 12.2 presents these and other developmental considerations, along with recommendations for accommodating them in classroom practices.

Chapter 11 describes the many reasons that students so often find the transition to middle school or high school unsettling.

Take developmental differences into account in planning your classroom management strategies.

Taking Individual and Group Differences into Account

Earlier we mentioned the importance of consistency and equity in enforcing rules. But when it comes to preventing off-task behaviors and supporting more productive ones, optimal strategies may differ considerably from one student to another. For example, during independent seatwork, some students may work quite well with classmates close by, whereas others may be easily distracted unless they can work in a quiet spot, perhaps near their teacher's desk. During small-group work, some groups may function effectively on their own, whereas others may need considerable guidance and supervision.

See Chapter 3 for more information about individual differences in temperament.

One important individual difference factor affecting classroom behavior is *temperament:* the extent to which a student is naturally inclined to be energetic, irritable, impulsive, and so on. To be effective classroom managers, we must realize that students' vastly different classroom behaviors may be due, in part, to biological and psychological predispositions that aren't entirely within their control. Such a realization should influence our beliefs about why students are acting as they are—that is, it should influence our *attributions*—and these beliefs will, in turn, affect our willingness to adapt classroom strategies to foster productive classroom behavior (Johnson et al., 2005; Keogh, 2003; Miller, 2006; Rothbart, 2011).

Cultural and Ethnic Differences Students who've grown up in diverse cultural and ethnic groups aren't always familiar with the unspoken standards for behavior in Western schools (Igoa, 1995; Tyler et al., 2008). Furthermore, some students may be unfamiliar with questions and hints that only indirectly tell them how they should behave—for instance, "Jessi, would you like to sit down?" Such students are apt to be better behaved (and also less confused) if we're more explicit in our requests—for instance, "Jessi, please sit down and focus on your schoolwork" (Adger et al., 2007; Woolfolk Hoy & Weinstein, 2006, p. 186). In addition, some students may not be native speakers of English, and thus linguistic challenges may arise; such students simply may not understand rules and procedures because of limited experience with English.

But perhaps most important for students from diverse backgrounds is a warm, supportive classroom atmosphere (Castagno & Brayboy, 2008; García, 1995; Meehan et al., 2003). For example, Black students in one eighth-grade social studies class explained why they liked their teacher so much:

> "She lets us express our opinions!"
> "She looks us in the eye when she talks to us!"
> "She smiles at us!"
> "She speaks to us when she sees us in the hall or in the cafeteria!" (Ladson-Billings, 1994, p. 68)

Remember that some students from diverse backgrounds may need explicit guidance about how they should behave at school.

DEVELOPMENTAL TRENDS

Table 12.2 Effective Classroom Management at Different Grade Levels

Grade Level	Age-Typical Characteristics	Example	Suggested Strategies
K–2	• Anxiety about being in school, especially in the first few weeks and especially for students without preschool experience • Lack of familiarity with unspoken rules about appropriate behavior • Short attention span and high level of distractibility • Little self-regulation • Desire for teacher affection and approval • Considerable individual differences in social skills	Immediately after lunch on the first day of school, a first-grade teacher gathers students at the front of the room for a storybook reading. Before she begins to read, she explains the importance of sitting quietly so that everyone can hear the story, and when students occasionally behave in ways that might distract others, she gently reminds them of appropriate behaviors.	• Invite students and parents to visit the classroom before school begins. • Place priority on forming warm, supportive relationships with students. • Be explicit about acceptable behavior; correct inappropriate behaviors gently but consistently. • Keep tasks short and focused. • Create a gathering place (e.g., a carpet) where students can sit close for whole-class activities. • Give students frequent opportunities to release pent-up energy. • Create areas where students can work independently on tasks.
3–5	• Desire for teacher and peer approval • Greater attentiveness to teachers who are emotionally expressive (e.g., teachers who often smile) • Increasing self-regulation skills • Gradually improving ability to reflect on one's own and others' thoughts and motives • Increasing disengagement from school if students are consistently encountering academic or social failure • Increasing likelihood of arguing with or verbally harassing teachers	Nine-year-old Bailey is often disruptive and socially inappropriate in class—so much so that her classmates avoid her as much as possible. On several occasions, her teacher takes her aside and respectfully requests more productive behavior. For example, the teacher says, "Bailey, I'm very happy to have you in my class, but it would really help me—and I think you, too—if you raised your hand before you answered a question. That way, other kids also have a chance to answer."	• Use two-way journals to communicate regularly with students. • In both words and actions, frequently show students that you're concerned about their academic progress and emotional well-being. • Provide increasing opportunities for independent work with enough structure to guide students' efforts. • In times of conflict among classmates, ask students to reflect on one another's thoughts and feelings. • Try to establish close, supportive relationships with students who appear to be disengaged.
6–8	• Anxiety about the transition to middle school • Decrease in intrinsic motivation to learn • Increasing tendency to challenge traditional school norms for behavior—for instance, norms regarding clothing and hairstyle • Increase in cheating behaviors; cheating less common if students think teachers respect them and instruction is focused on mastery • Heightened concern about ability to fit in and be accepted by peers • Increase in bullying behaviors	The son of a neglectful mother, 14-year-old Jack has frequently moved from one relative's home to another. He's now spending a second year in seventh grade, where he's disruptive and disrespectful. When he calls a classmate an "asshole," his teacher takes him aside and says, "I won't tolerate that offensive word. But I know you're going through a lot at home, and I really want you to be successful at school. How can I help?" Jack starts asking the teacher for help on assignments.	• Find occasions to interact with students outside of class (e.g., attend sports events). • Plan lessons that are engaging and relevant to students' lives. • Prohibit modes of dress that may threaten students' safety and well-being (e.g., racist T-shirts, sexually revealing attire), but otherwise give students some freedom of expression in what they wear. • Provide sufficient academic support so that students have no reason to cheat. • Don't tolerate bullying or other forms of aggression; address their underlying causes. • Reach out to students who seem socially unconnected (e.g., invite them to join you for lunch in your classroom).
9–12	• Anxiety about transition to high school, especially if the seventh and eighth grades were in elementary school • Social and romantic relationships can be distracting • Considerable self-regulation in some students • High incidence of cheating, in part because peers communicate that it's acceptable • Disdain for classmates who work hard for teacher approval • Tendency for some to think that misbehavior will gain peers' admiration • Increase in violent behaviors in some schools	When a teacher sees 16-year-old Jerrod standing alone at a dance, he approaches the boy to express empathy. "I remember my first school dance," the teacher tells him. "Boy, did I feel awkward! I was too shy to ask a girl to dance, and I was so afraid of making a fool of myself. What do you think we might do to make these events less intimidating?" Jerrod smiles and admits that he feels the same, and they brainstorm ideas for helping students feel more comfortable at dances.	• Remember that even in high school, students achieve at higher levels when they have supportive relationships with teachers. • Regularly plan activities that involve social interaction. • When students have few self-regulation skills, provide guidance and support to help them stay on task. • Describe what cheating is and why it's unacceptable. • Communicate approval privately rather than publicly. • Proactively address violence.

SOURCES: Some characteristics and recommendations based on Blanton & Burkley, 2008; Blugental et al., 1999; K. Carter & Doyle, 2006; Castagno & Brayboy, 2008; Cizek, 2003; Cook & Coley, 2017; Emmer & Gerwels, 2006; Espinoza & Juvonen, 2011; Fingerhut & Christoffel, 2002; Hamre & Pianta, 2005; Hughes et al., 2008; Ladd et al., 2008; McMahon et al., in press; Mehan, 1979; Murdock et al., 2001; E. O'Connor & McCartney, 2007; Pellegrini, 2002; many other ideas derived from discussions in earlier chapters.

Simple gestures such as these go a long way toward establishing the kinds of teacher–student relationships that lead to a productive learning environment. It's also essential that we create a sense of community in the classroom—a sense that we and our students share common goals and are mutually supportive of everyone's reaching those goals. This sense of community is consistent with the cooperative spirit evident in many Hispanic, Native American, and African American groups. It can also be reassuring to students who perceive themselves to be different in an obvious way and thus might have exceptional concerns about not fitting in with their peer group (Cohen & Garcia, 2008; Ladson-Billings, 1994; Tyler et al., 2008).

Gender Differences On average, girls tend to form more affectionate and productive relationships with teachers than boys do (Hughes et al., 2012; Tutwiler, 2007; Wentzel et al., 2010). A variety of reasons may underlie some boys' nonproductive relationships with teachers. Boys are more prone to physical aggression than girls, and they're more likely than girls to be oppositional and defiant when asked to engage in tasks they'd rather not do. And in general, boys are temperamentally more active and have less self-control, to the point that they may have trouble sitting still for lengthy periods (Eaton & Enns, 1986; Rothbart, 2011). As teachers we can deter aggressive behaviors, particularly in boys, if we are attuned to students' aggressive tendencies and to the social relationships among students in our classes (Ahn & Rodkin, 2014). Referring back to the concept of "withitness," we need to be aware of all of the academic events occurring in our classrooms, but also of the social interactions that occur. Notice what happened to one fourth grader (now a successful college professor) when his teacher took his temperament into consideration:

Make a special effort to establish good relationships with emotionally distant or chronically misbehaving students.

> One day when I was especially restless . . . I could see Miss Rickenbrood circling to the back of the room. . . . After a few minutes, she leaned over and whispered in my ear, "Tom, would you like to go outside and run?"
>
> I was stunned. To go outside and run? On my own? When it wasn't recess? What could have possessed this woman to ignore all school rules and allow me to run? I said yes and quietly went to put on my coat. As I recall, I didn't actually run in the playground (people would be watching from inside the building), but stood outside in the doorway, in the cold, marveling at my freedom. I returned to class after about ten minutes, settled for the rest of the day. (Newkirk, 2002, pp. 25–26)

When students face exceptional challenges at home, make an extra effort to create an affectionate, supportive, predictable, and safe environment at school.

Socioeconomic Differences Having teachers' affection, respect, and support is even more important for students who face exceptional hardships at home, such as poverty, violent neighborhoods, and homelessness. Some of these students may be prone to anger and disrespectful classroom behavior, undoubtedly as a result of their difficult circumstances outside of school (Payne, 2005). Yet when students from economically impoverished backgrounds have one or more caring, trustworthy adults in their lives—and when they regularly come to a classroom that's warm, predictable, and dependable—they often have a strong sense of self-worth and autonomy. Hence, they're better equipped to succeed both at school and in the outside world. In other words, they're more likely to be *resilient*—to rise above their adverse circumstances (Abelev, 2009; Becker & Luthar, 2002; Masten, 2001; Polakow, 2007).

You can learn more about resilience in the discussion of *students at risk* in Chapter 4.

Chapter 5 identifies specific categories of special needs that fall within the five general categories listed in Table 12.3.

Accommodating Students with Special Needs Most students with special needs can more easily adapt to a general education setting when the classroom is orderly and well structured. Even more so than their peers, students with disabilities benefit from classrooms in which procedures for performing certain tasks are specified, expectations for student behavior are clear, and misbehaviors are treated consistently (Heward, 2009; Pfiffner et al., 2006;). Although some students with disabilities may need considerable guidance and support in order to behave appropriately, unless there are extenuating

STUDENTS IN INCLUSIVE SETTINGS

Table 12.3 Maintaining a Productive Classroom Environment for Students with Special Educational Needs

Category	Characteristics You Might Observe	Suggested Strategies
Students with specific cognitive or academic difficulties	• Difficulty staying on task • Misbehaviors such as hyperactivity, impulsiveness, disruptiveness, and inattentiveness (in some students) • Poor time management skills and/or a disorganized approach to accomplishing tasks (in some students)	• Closely monitor students during assignments. • Make sure students understand their assignments; if appropriate, give extra time to complete them. • Make expectations for behavior clear and enforce rules consistently. • Reinforce (e.g., praise) desired behaviors immediately; be specific about the behaviors you are reinforcing. • For hyperactive students, plan short activities that help them settle down after periods of physical activity. • For impulsive students, teach self-regulation skills (e.g., verbal self-reminders about appropriate behavior). • Teach strategies for organizing time and work (e.g., tape a schedule of daily activities to students' desks).
Students with social or behavioral problems	• Frequent overt misbehaviors, such as acting out, aggression, noncompliance, destructiveness, or stealing (in some students) • Difficulty inhibiting impulses • Misbehaviors triggered by changes in the environment or daily routine or by sensory overstimulation (for some students with autism spectrum disorders) • Difficulty interacting effectively with peers • Difficulty staying on task • Tendency to engage in power struggles with teachers (for some students)	• Specify in precise terms what behaviors are acceptable and unacceptable; establish, enforce, and remind students about rules for behavior. • Maintain a predictable schedule; warn students ahead of time about changes in the routine. • Explicitly teach social skills. • Closely monitor students during independent assignments. • Give students a sense of autonomy about some aspects of classroom life; minimize use of coercive techniques. • Make extra effort to show students that you care about them as individuals.
Students with general delays in cognitive and social functioning	• Occasional disruptive classroom behavior (for some students) • Dependence on others for guidance about how to behave • More appropriate classroom behavior when expectations are clear	• Establish clear, concrete rules for behavior. • As necessary, remind students about appropriate behavior; keep directions simple. • Use structured behaviorist approaches to promote desired behaviors. • Give explicit feedback about what students are and are not doing appropriately.
Students with physical or sensory challenges	• Social isolation from classmates (for some) • Difficulty accomplishing tasks as quickly as other students • Difficulty understanding directions and other spoken messages about desired behaviors (for students with hearing loss)	• Establish a strong sense of community within the classroom. • When appropriate, give extra time to complete assignments. • Keep unnecessary noise to a minimum if one or more students have hearing loss.
Students with advanced cognitive development	Off-task behavior in some students, often due to boredom during easy assignments and activities	• Assign tasks appropriate to students' cognitive abilities.

SOURCES: Barkley, 2006; Beirne-Smith et al., 2006; Buchoff, 1990; Chang & Davis, 2009; Clark, 1997; Dai, 2010; Dempster & Corkill, 1999; Diamond, 1991; Granger et al., 1996; Gregg, 2009; Heward, 2009; Koegel et al., 1996; Mendaglio, 2010; Mercer & Pullen, 2005; Moffett & Morrison, 2020; Morgan & Jenson, 1988; Patton et al., 1996; Pellegrini & Horvat, 1995; Turnbull et al., 2010; Winner, 1997.

circumstances, these students must incur the same consequences as everyone else when their behaviors are out of line. Table 12.3 offers many suggestions for accommodating students with special needs.

Expanding the Sense of Community Beyond the Classroom

Learning Objective 12.2 **Explain how you can coordinate your efforts with colleagues, community agencies, and parents to maximize students' academic and personal development.**

Students' learning and development depend not only on what happens inside the classroom, but also on what happens in other parts of the school, in the community, and at home. To be most effective, we should coordinate our efforts with other influential individuals in students' lives—with other school personnel, with professionals at community agencies, and especially with students' parents or other primary caregivers. Ideally, we should think of such joint efforts as *partnerships* in which everyone is working together to promote students' long-term development and learning.

Working with Other School Personnel

It's important that all school personnel communicate consistent messages and expectations using strategies such as these:

- Identify common goals regarding what students should learn and achieve.
- Establish a set of shared values, and regularly ensure that those shared values are reflected in teaching and assessment practices.
- Work together to identify and overcome obstacles to students' achievement.
- Establish a common set of standards for students' behavior, along with systematic, schoolwide procedures for encouraging productive and respectful behaviors.
- Make a group commitment to promote equality and multicultural sensitivity throughout the school community. (Battistich et al., 1997; Lane et al., 2009; Lee & Shute, 2010; Levine & Lezotte, 1995; T. J. Lewis et al., 2006)

Chapter 6 describes schoolwide positive behavioral interventions and supports in more detail.

Collaborate with colleagues to create an overall sense of school community.

One increasingly popular approach is **schoolwide positive behavioral interventions and supports**, in which school staff jointly and explicitly define, teach, and reinforce appropriate behaviors and provide varying levels of support tailored to students' needs (e.g., Ihlo & Nantais, 2010; Osher et al., 2010; Warren et al., 2006).

Ideally, in addition to creating a sense of community within our individual classrooms, we should create an overall **sense of school community**—a shared belief that all staff and students within a school are working together to help everyone learn and succeed (Battistich et al., 1995; Battistich et al., 1997; Watson & Battistich, 2006). When a school has a genuine sense of community, students regularly get two very important messages: (1) All school personnel are working together to help students become informed and productive citizens; and (2) students can and should *help one another.* A sense of school community involves close student–student relationships not only within individual classrooms but also across classrooms and grade levels. Cross-class peer tutoring, participation in extracurricular activities, student involvement in school decision making, frequent use of school mascots and other traditional school symbols—all of these help to create a sense that students are members of a mutually supportive school "family" (Juvonen, 2006; Nucci, 2009; Robinson et al., 2005).

As teachers, we need to make the extra effort to create school communities that are welcome to racially and ethnically diverse students. Some instructional practices and policies may be well intentioned but may actually detract from diverse students' sense of community in their schools. Racially diverse students may feel like they are not a part of the larger school community because they are not represented in many academic tasks (e.g., in books that are being read). They also may experience more severe penalties than White students for behavioral infractions, and may feel that teachers hold lower expectations of them than they do of other students (Gray et al., 2020; Pearman et al., 2019).

When teachers and students share an overall sense of school community, students have more positive attitudes toward school, are more motivated to achieve at high levels, exhibit more prosocial behavior, and interact more often with peers from different backgrounds. Furthermore, teachers have higher expectations for students' achievement and a greater sense of self-efficacy about their teaching effectiveness (Battistich et al., 1995, 1997; Langer, 2000). In fact, when teachers work together, they have higher *collective self-efficacy*—a belief that by working as a team, they can have an impact on students' learning and achievement—and this collective self-confidence is correlated with students' academic performance (Goddard et al., 2000; Lee & Shute, 2010; Sørlie & Torsheim, 2011). Such a team spirit has an additional advantage for beginning teachers: It provides the support structure (scaffolding) they may need, especially when working with students who are at risk for school failure. New teachers report greater confidence in their ability to help students learn and achieve when they collaborate regularly with their colleagues (Chester & Beaudin, 1996).

Collective self-efficacy is a key concept in social cognitive theory (see Chapter 10).

Work cooperatively with other agencies that play key roles in students' lives

Working with the Community at Large

Students almost always have regular contact with other organizations besides school—possibly youth groups, community organizations, social services, churches, hospitals, mental health clinics, and local judicial systems. And some students live in neighborhoods very different from their teachers' neighborhoods. As teachers, we enhance our effectiveness if we understand the environments in which our students live and if we think of ourselves as integral members of a larger community that promotes children's and adolescents' long-term development. For example, we must educate ourselves about students' cultural backgrounds, perhaps by taking course work and getting involved in local community events (Castagno & Brayboy, 2008; McIntyre, 2010). We must also keep in contact with other people and institutions that play major roles in students' lives, coordinating our efforts whenever possible (Epstein, 1996; Kincheloe, 2009).

Working with Parents

Above all, we must work cooperatively with students' parents and other primary caregivers. Productive parent–teacher relationships may be especially important when working with students from diverse cultural backgrounds, and they're *essential* when working with students who have physical, cognitive, or behavioral disabilities (Hidalgo et al., 1995; Iruka et al., 2011; Reschly & Christenson, 2009; Waasdorp et al., 2011).

In the United States, the Individuals with Disabilities Education Act (IDEA) ensures parents' involvement in educational decision making for students with disabilities (see Chapter 5).

We must keep in mind that families come in a variety of forms and that students' primary caregivers aren't always their biological parents. For example, in some ethnically diverse communities, grandmothers take primary responsibility for raising children (Dantas & Manyak, 2010; Stack & Burton, 1993). To keep our discussion simple, we use the term *parents* in upcoming paragraphs, but in fact, we are referring to all primary caregivers.

Remember that students' families vary and primary caregivers may be people other than their parents.

Communicating with Parents We should open lines of communication with parents as soon as classes begin—perhaps even before that—and stay in regular contact with them throughout the school year. We should inform them of their children's accomplishments and keep them apprised of any behaviors that are consistently interfering with learning and achievement. Regular communication also provides a means through which parents can give *us* information, which might yield new ideas about how we might most effectively work with their children. In addition, regular communication enables us to coordinate our classroom strategies with those that parents use at home. Communications with parents should not just occur when students misbehave; in fact, communication can be particularly beneficial when we have *good* relationships with our students (McCormick et al., 2013). Following are several common mechanisms for enhancing school–family communication.

Remember that communication with parents should be a two-way street, with information traveling in both directions.

Parent–Teacher Conferences. In most school districts, formal parent–teacher conferences are scheduled one or more times a year. We may want to include students in

Figure 12.6 Suggestions for conducting effective parent–teacher conferences.

Suggestions for Any Parent–Teacher Conference

- Schedule the conference at a time that accommodates parents' jobs and other obligations.
- Accommodate cultural differences. For example, invite extended family members who play key roles in caregiving, and include a trusted individual who can translate for non-native-English speakers.
- Prepare ahead of time. For example, review what you know about the student (e.g., academic progress, classroom behavior), organize your thoughts, create an agenda for the meeting, and have examples of the student's work on hand.
- Create a warm, nonjudgmental atmosphere. For example, express appreciation that the parents have come and encourage them to offer their thoughts and perspectives. Remember that your objective is to work cooperatively and constructively with parents to create the best educational program possible for their child. Also remember that some parents may have had bad personal experiences when they were students, so they may come into the conference expecting to have a difficult meeting.
- Describe your general goals and expectations for students.
- Avoid educational jargon with which parents may be unfamiliar; describe the student's performance in ways a noneducator can understand. If you report standardized test scores to parents, make sure that you can explain the scores to them and not just report numbers that may seem meaningless.
- Actively seek information. For example, ask parents to describe their child's strong points and favorite activities.
- Jointly explore possible ways in which you and parents might support one another's efforts to promote the student's development.
- End on a positive note—perhaps with a review of the student's many strengths and the progress he or she has made.
- Follow through with anything you have said you will do.

Additional Suggestions for a Student-Led Conference:

- Meet with the student ahead of time to agree on appropriate work samples to share.
- Model and role-play effective conferences in class, and give students time to practice with their classmates.
- Schedule a backup audience (e.g., a former teacher or trusted friend) who can sit in if the student's parents don't attend.
- Offer additional time in which you can meet without the student if the parents so desire.
- Talk with the student afterward about what went well and how the two of you might improve the next conference.

conferences—essentially making them parent–teacher–student conferences—and in some instances we might even ask students to *lead* the conferences. By holding student-led conferences, we increase the likelihood that parents will come to the conferences, we encourage students to reflect on their own academic progress, and we give students practice in communication and leadership skills. Furthermore, teachers, students, and parents alike are apt to leave such meetings with a shared understanding of the progress that has been made and of subsequent steps that need to be taken. Even if students do lead the conferences, however, it is important for teachers to still play an active role, because parents want to get feedback from you. Keep in mind that parents might want to speak privately with teachers too. Figure 12.6 offers suggestions for conducting effective conferences.

Consider including students in parent–teacher conferences.

Regularly communicate with parents in written form.

Written Communication. Written communication can take a variety of forms. It can be a general welcome letter sent to students and parents before the school year begins. It can be a weekly checklist that documents a student's progress. It can be a quick, informal note, email, or text message acknowledging a significant accomplishment (Bachman et al., 2022). It can be a letter to parents explaining how you are working with students to get through a difficult period (e.g., the unexpected death of a classmate). Or it can be a newsletter that describes class activities, expectations for homework, and so on. All of these mechanisms have two things in common: They let parents know what's happening at school and they convey a genuine desire to stay in touch with families.

See Chapter 13 for more information about constructing class websites.

Class Websites and Learning Management Systems. Many teachers now create class websites or use learning management systems (e.g., Canvas or Schoology) on which they post instructional goals, assignments, materials, videos, and anything that can be digitized; in fact, some schools now require the use of such websites. Typically teachers' websites are available to parents as well as students, but, as is true for email messages, they're most appropriate for parents who regularly use computers and the internet.

Telephone Conversations. In the elementary grades, telephone calls are a useful way of introducing oneself at the start of the school year and following up on conferences that parents have missed (Davis & Yang, 2005; Striepling-Goldstein, 2004). At all grade levels, telephone calls are often appropriate when something unusual has happened—for instance, when a student has made a noteworthy step forward or, instead, has recently shown an unexpected decline in performance. Often, parents receive phone calls from teachers when something bad has happened—when a student gets a low grade or behaves badly; try to also call parents when something good happens—when students show improvement or do something nice for others, or just to "check in" and say that all is going well. When parents are aware of their children's successes and develop positive perceptions of their children's competence, the children's academic achievement benefits (Gut et al., 2013). Likewise, parents should feel free to call *us*. Because many parents are at work during the school day, it's often helpful to accept and encourage calls at home during the early evening hours.

Make a quick telephone call to inform parents of exciting new accomplishments or potential areas of concern.

Parent Discussion Groups. In some instances, we may want to assemble a group of parents to discuss issues of mutual interest—perhaps specific topics that might be included in the class curriculum or effective strategies that parents can use to promote their children's academic, personal, and social development (Epstein, 1996; Fosnot, 1996; Rudman, 1993). Some teachers have successfully used parent *coffee nights* or *coffee mornings*, during which they explain a new instructional strategy, or *author teas*, during which students read poetry and short stories they have written.

Getting Parents Involved in School Activities. Ultimately, the best means of communicating and collaborating with parents is to get them actively involved in school life and learning, and perhaps get other family members involved as well. Students whose parents are involved in school activities have better attendance records, higher achievement, and more positive attitudes toward school. Although the reasons for these findings aren't entirely clear, they appear to be due partly to the fact that parents who actively participate in school activities can more effectively coordinate their efforts at home with teachers' efforts in the classroom (Hill & Taylor, 2004; Hindman & Morrison, 2011; Lam et al., 2013; Monti et al., 2014).

Parental involvement in school activities can take a variety of forms. For instance, we might:

- Invite parents to an open house or musical performance in the evening.
- Request parents' help with a weekend fundraiser.
- Seek volunteers to help with field trips, special projects, or individual tutoring during the school day.
- Use parents and other community members as resources to provide a multicultural perspective of the local community. (Davis & Yang, 2005; McCarty & Watahomigie, 1998; McIntyre, 2010; Minami & Ovando, 1995)

Many parents become involved in such activities only when they have a specific invitation to do so and when they know that school personnel genuinely want them to be involved (Green et al., 2007; Serpell et al., 2005). Some parents—especially those from underrepresented racial, ethnic, or religious groups—may not take a general, open-ended invitation seriously. A personal invitation can often make all the difference, as one mother explained:

> The thing of it is, had someone not walked up to me and asked me specifically, I would not hold out my hand and say, "I'll do it." . . . You get parents here all the time, black parents that are willing, but maybe a little on the shy side and wouldn't say I really want to serve on this subject. You may send me the form, I may never fill the form out. Or I'll think about it and not send it back. But you know if that principal, that teacher, my son's math teacher called and asked if I would . . . (Carr, 1997, p. 2).

Parents can also be invaluable in helping children with homework. Even parents who have few academic skills themselves can provide worthwhile support—for instance, by communicating the importance of doing well, providing a quiet place to study, and making other activities contingent on homework completion. The more parents do such things, the higher their children's achievement is likely to be. Furthermore, many parents are open to teacher suggestions about how they might best be of assistance. Thus, you might help parents to understand that their involvement with homework will be particularly beneficial when they are perceived as supportive; conflict and interference with homework actually can be detrimental to achievement (Dumont et al., 2012; Dumont et al., 2014; Hong & Ho, 2005; Lee & Shute, 2010; Lee & Bowen, 2006; Patall et al., 2008; Walker & Hoover-Dempsey, 2006).

Offer suggestions about things parents might do to help their children with homework.

Encouraging Reluctant Parents Despite our best efforts, a few parents may remain uninvolved in their children's education; for example, they may never attend scheduled parent–teacher conferences. But before we jump too quickly to the conclusion that these parents are also *uninterested* in their children's education, we must recognize several possible reasons that parents might be reluctant to make contact with us. Some may have an exhausting work schedule or lack adequate child care. Others may know little English, have difficulty finding their way through the school system, or believe it's inappropriate to bother teachers with their concerns. Still others may have had such bad experiences when they were students that they feel uncomfortable in a school building. And a few parents may be victims of mental illness, physical illness, or substance abuse, limiting their ability to support their children financially, academically, or otherwise (Bornstein & Cote, 2010; Carbrera et al., 2006; Cazden, 2001; Dantas & Manyak, 2010; Lee & Bowen, 2006; Ogbu, 2003).

Identify alternative sources of academic support when a student's family is unable to provide it.

Experienced educators have offered numerous suggestions for getting reluctant parents more involved in their children's schooling:

- Make an extra effort to gain parents' trust and confidence—for instance, by demonstrating that their contributions are both helpful and appreciated.
- Encourage parents to reach out when they have questions or concerns.
- Invite other important family members (e.g., grandparents, aunts, uncles) to participate in school activities, especially if a student's cultural group places high value on extended families.
- Offer suggestions about learning activities parents can easily do with their children at home.
- Find out what parents do exceptionally well (e.g., carpentry, cooking), and ask them to share their talents with students.
- Provide opportunities for parents to volunteer for jobs that don't require them to leave home (e.g., to be someone whom students can call when they're unsure of homework assignments).
- Identify specific individuals (e.g., bilingual parents) who can translate for those who speak little or no English.
- Make home visits *if* such visits are welcomed.
- Offer resources for parents at the school—for instance, contacts with social and health services, or classes in English, literacy, home repairs, and crafts. (Castagno & Brayboy, 2008; Dantas & Manyak, 2010; Davis & Yang, 2005; Epstein, 1996; Finders & Lewis, 1994; Hidalgo et al., 1995; López, 2001; Salend & Taylor, 1993; Sanders, 1996; Walker & Hoover-Dempsey, 2006)

Another potentially effective strategy is to reinforce *parents* as well as students when the students do well at school. One administrator at a school serving many immigrant students put it this way:

> One of the things we do . . . is that we identify those students that had perfect attendance, those students that passed all areas of the [statewide achievement tests] and

> were successful. We don't honor the student, we honor the parents. We give parents a certificate. Because, we tell them, "Through your efforts, and through your hard work, your child was able to accomplish this." (López, 2001, p. 273)

Give recognition to parents whose children do well or show improvement at school.

A few parents may resist all of our efforts to get them involved. Especially in such circumstances, we must never penalize students for their parents' actions or inactions. And we must realize that as teachers, *we* are apt to be among the most important academic and emotional resources in these students' lives.

Don't penalize students for things that their parents do or don't do.

Considering Cultural Differences When Working with Parents As we work with parents, we must be aware that people from different cultural and ethnic groups sometimes have radically different ideas about how—and also how *much*—to control their children's behavior. For example, many parents from Asian cultures expect children to obey adult authority figures without question; such parents often think that Western teachers are much too lenient with students (Dien, 1998; Hidalgo et al., 1995; Kağitçibaşi, 2007; Tamis-Lemonda & McFadden, 2010). In contrast, parents in some Native American cultures believe that children have a right to make their own decisions; from their perspective, good parenting involves providing gentle suggestions and guidance rather than insisting that children behave in certain ways (Deyhle & LeCompte, 1999). Some cultural and religious groups use ostracism in an effort to keep children in line: The child is ignored—for instance, given the "silent treatment"—for an extended period (K. D. Williams, 2001). We need to be wary of stereotyped comments suggesting that parents from some cultural groups do not want to be involved with schools; most parents do want to be involved in some way (e.g., Walker et al., 2011).

Communicate your confidence in each student's ability to succeed, as well as your commitment to working cooperatively with parents.

We must realize that parents want what's best for their children and recognize the value of a good education. It's essential, then, that we not leave parents out of the loop when we're concerned about how their children are performing in school. And as we talk with them, we must listen to their attitudes and opinions with an open mind and try to find common ground on which to develop strategies for helping their children thrive in the classroom.

Dealing with Misbehaviors

Learning Objective 12.3 **Identify six general approaches to dealing with student misbehaviors and the circumstances and cultural contexts in which each approach might be appropriate.**

We have emphasized that when students are engaged with and enjoying their academic work, and when they feel supported in their efforts to succeed at their academic work, they are less likely to engage in disruptive behaviors. But, despite our best efforts to create a classroom environment that promotes learning, one or more of our students will occasionally behave in undesirable ways. For purposes of our discussion, we'll define a **misbehavior** as any action that potentially disrupts learning and planned classroom activities, puts one or more students' or staff's physical safety or psychological well-being in jeopardy, or violates basic moral and ethical standards. Some misbehaviors are relatively minor and have little long-term impact. Such behaviors as talking out of turn, writing brief notes to classmates, using a smartphone in class, and submitting homework assignments after their due date—especially if these behaviors occur infrequently—generally fall in this category. Other misbehaviors are far more serious, in that they definitely interfere with the learning or well-being of one or more students. For example, when students scream at their teachers, hit classmates, or habitually refuse to participate in learning activities, then classroom learning—certainly that of the guilty party, and sometimes that of other students as well—can be adversely affected, as can the overall classroom climate.

Typically, only a few students are responsible for the great majority of misbehaviors in any single class (Doyle, 2006). These students are apt to be among our greatest challenges, and it can be all too tempting to write them off as lost causes. Yet we must work vigorously to turn them in more productive directions: Without active interventions by teachers and other caring adults, students who are consistently disruptive or in other ways off task in the early grades may continue to show behavior problems later on (Dishion et al., 2008; Emmer & Gerwels, 2006; Vitaro et al., 2005). In addition, new teachers in particular enjoy their work more and feel better about their jobs when they feel efficacious about managing student behavior (Dicke et al., 2014). As teachers, we need to plan ahead about how we'll address students' misbehaviors. We also need to take personal responsibility for behavior management in our classrooms—sometimes student learning outcomes suffer more because of teachers not knowing effective management techniques than because of the actual behaviors of the students (Hochweber et al., 2014). Although we must be consistent in the consequences we impose for blatant rule infractions (recall our earlier discussion of consistency and equity), a variety of strategies can be useful in reducing counterproductive behaviors over the long run. We need to be consistent in our delivery of various interventions to students; for example, low-income Black boys, as well as LGBTQ+ youth, tend to be disciplined disproportionately more than other students (Petras et al., 2011; Poteat et al., 2016; Welsh & Little, 2018). Such disproportionalities in discipline have been shown to be associated with racial inequities in being arrested as an adult (Barnes & Motz, 2018).

Here we'll examine several general strategies and their appropriate applications: ignoring the behavior, cueing a student, talking with a student in private, teaching self-regulation skills, conferring with parents, and planning and conducting a systematic intervention. We'll also include a discussion of recognizing microaggressions and peer mediation. Above all else, these strategies should be implemented with the larger goal of communicating to our students that we care about, trust, and support them (Amemiya et al., 2020):

Ignoring Certain Behaviors

On some occasions, our best course of action is *no* action, at least nothing of a disciplinary nature. For example, consider these situations:

- Dimitra rarely breaks classroom rules. On one occasion, however, after you've just instructed students to work quietly and independently at their seats, you see her briefly whisper to the girl beside her. Other students don't seem to notice that she is temporarily disobeying your instructions.
- Randall is careless in chemistry lab and accidentally knocks over a small container of liquid—a harmless one, fortunately. He quickly apologizes and cleans up the mess.

Will these behaviors interfere with Dimitra's or Randall's academic achievement? Are they "contagious" behaviors that will spread to other students, as the horseplay did in Ms. Cornell's class? The answer to both questions is "Probably not."

Whenever we stop an instructional activity to deal with a misbehavior, even for a few seconds, we can disrupt the momentum of the activity and draw students' attention to a misbehaving classmate. By drawing other students' attention to a particular misbehavior, we may unintentionally be reinforcing it.

Ignoring misbehavior is often reasonable in circumstances such as these:

- When the behavior is a rare occurrence and probably won't be repeated
- When the behavior is unlikely to spread to other students
- When the behavior is the result of unusual and temporary conditions (e.g., the last day of school before a holiday, or an unsettling event has taken place in a student's personal life)

- When the behavior is typical for the age group (e.g., kindergartners becoming restless after sitting for an extended time, sixth-grade boys and girls resisting holding one another's hands during dance instruction)
- When the behavior's natural consequence is unpleasant enough to deter a student from repeating it
- When the behavior isn't interfering with classroom learning (Davis & Thomas, 1989; Doyle, 1986, 2006; Dreikurs, 1998; Munn et al., 1990; Silberman & Wheelan, 1980; Wynne, 1990)

Dimitra's behavior—briefly whispering to a classmate during independent seatwork—is unlikely to spread to her classmates (they didn't see her do it) and probably isn't an instance of cheating (it occurs before she begins working on the assignment). Randall's behavior—knocking over a container of liquid in chemistry lab—has in and of itself resulted in an unpleasant consequence: He must clean up the mess. In both situations, then, ignoring the misbehavior is probably best.

Ignore minor infractions that are unlikely to be repeated or to spread to other students.

Cueing Students

In some situations off-task behaviors, although not serious in nature, *do* interfere with learning and must be discouraged. Consider these situations as examples:

- As you're explaining a difficult concept, Mia is busily writing. At first you think she's taking notes, but then you see her pass the paper across the aisle to Kang. A few minutes later you see Kang pass the same sheet back to Mia. It appears that the two students are exchanging personal notes when they should be attending to the lesson.
- You've separated your class into small groups for a cooperative learning activity. One group is frequently off task and probably won't complete the assignment if the students don't get down to business soon.

Gently cue students about desired behaviors.

Effective classroom managers handle such minor behavior problems as unobtrusively as possible: They don't stop the lesson, distract other students, or call unnecessary attention to the inappropriate behavior. In many cases they use **cueing**: They give a brief signal—perhaps a stern look or a simple verbal directive—to communicate that the misbehavior has been noticed and should cease. Ideally such cues focus students' attention on what *should* be done rather than on what *isn't* being done (Evertson & Emmer, 2009; Lane et al., 2011). For instance, instead of chastising students for being overly noisy during a cooperative group activity, a teacher might say, "As you exchange ideas, remember to use your *indoor voices* so that you don't distract other groups."

Discussing Problems Privately with Students

Sometimes brief cues are insufficient to change a student's misbehavior. Consider these situations:

- Alonzo is almost always a few minutes late to your third-period algebra class. When he finally arrives, he takes several more minutes to pull his textbook and other class materials out of his backpack. You've often reminded him about the importance of coming to class on time, yet his tardiness continues.
- Aubrey rarely completes assignments; in fact, she often doesn't even *begin* them. On many previous occasions you've gently tried to get her on task, but usually without success. Today, when you look Aubrey in the eye and ask her point blank to get to work, she defiantly responds, "I'm not going to do it. You can't make me!"

In such situations, talking privately with the student is the next logical step. The discussion should be *private* for several reasons. First, as noted earlier, calling peers' attention to a problem behavior may actually reinforce the behavior rather than discourage it. Alternatively, the attention of classmates may cause a student to feel excessively

Speak privately with students about chronic behavior problems.

embarrassed or humiliated—feelings that can make the student overanxious about coming to school in the future. Finally, when we spend too much class time dealing with a single misbehaving student, other students are apt to get off task as well (Doyle, 2006; Emmer & Gerwels, 2006; Scott & Bushell, 1974).

Private conversations give us an opportunity to explain why certain behaviors are unacceptable and must stop. They also give students a chance to explain why they behave as they do. For example, Alonzo might explain his chronic tardiness by revealing that he has diabetes and must check his blood sugar level between his second- and third-period classes. He can perform the procedure himself but would prefer to do it in the privacy of the school nurse's office. Meanwhile, Aubrey might describe her long-standing frustration with subject matter and assignments she perceives as being impossible to understand. A boy with a reading disability once voiced such frustration in an interview with a researcher:

> They [teachers] used to hand us all our homework on Mondays. One day my teacher handed me a stack about an inch thick and as I was walking out of class there was a big trash can right there and I'd, in front of everybody including the teacher, just drop it in the trash can and walk out. I did this because I couldn't read what she gave me. It was kind of a point that I wanted to get the teacher to realize. That while I'm doing it, inside it kind of like hurt because I really wanted to do it but I couldn't and just so it didn't look like I was goin' soft or anything like that I'd walk over to the trash and throw it in. (Zambo & Brem, 2004, p. 6)

Students' explanations often provide clues about how best to deal with their behavior over the long run. For example, given his diabetes, Alonzo's continued tardiness to class might be inevitable. Perhaps we could reassign him to a seat by the door, enabling him to join class unobtrusively when he arrives, and we might ask the student next to him to quietly fill him in on the lesson in progress. Aubrey's frustration with her schoolwork suggests that she needs additional scaffolding to help her succeed. It also hints at a possible undiagnosed learning disability that might warrant a referral to the school psychologist or other diagnostician.

Students won't always provide explanations that lead to such logical solutions, however. For example, it may be that Alonzo is late to class simply because he wants to spend more time in the hall with friends. Or perhaps Aubrey doesn't want to do her assignments because, as she says, "I'm sick and tired of other people always telling me what to do." In such circumstances it's essential that we not get into a power struggle with the student—a situation in which one person wins by dominating the other in some way. Several strategies can minimize the likelihood of a power struggle:

- Speak in a calm, matter-of-fact manner, describing the problem as you see it. ("You haven't turned in a single assignment in the past three weeks. You and I would both like for you to do well in my class, but that can't happen unless we *both* work to make it happen.")
- Present the problem as one involving unproductive behavior, *not* a personality flaw. ("You've come to class late almost every day this month.")
- Listen empathetically to what the student has to say, being openly accepting of their feelings and opinions. ("I get the impression that you don't enjoy my class very much; I'd really like to hear your concerns.")
- Summarize what you think the student has told you, and seek clarification if necessary. ("It sounds as if you'd rather not let your classmates know how much trouble you're having with your schoolwork. Is that the problem, or is it something else?")
- Give **I-messages**; that is, describe the effects of the problem behavior, including your personal reactions to it, in a calm, relatively nonaccusatory manner. ("When you come to class late each day, I worry that you're getting further and further behind, and I'm concerned that you don't seem to value your time in my classroom.")

- Give the student a choice from among two or more acceptable options. ("Would you rather try to work quietly at your group's table, or would it be easier if you sat somewhere by yourself to complete your work?")
- Especially when working with an adolescent, try to identify a solution that allows the student to maintain credibility in the eyes of peers. ("I suspect you might be worrying that your friends will think less of you if you comply with my request. What might we do to address this problem?") (Colvin et al., 1997; Emmer & Evertson, 2009; Henley, 2010; Keller & Tapasak, 2004; Lane et al., 2006)

Ultimately we must communicate (1) our interest in the student's long-term academic achievement, (2) our concern that the misbehavior is interfering with that achievement, and (3) our commitment to working cooperatively with the student to alleviate the problem.

Recognizing Microaggressions Sometimes students may make statements or engage in behaviors that seem harmless to them, but may be perceived as harmful by others. Such incidents are referred to as **microaggressions**. Microaggressions occur among students of any age, and they are broad in scope: they can be related to a variety of issues, including race, socioeconomic status, ethnicity, sexuality, ability, and numerous other personal attributes (Wintner et al. 2017). Microaggressions generally have the following characteristics (Suárez-Orozco et al., 2015; Sue, 2017; Sue et al., 2007; Wintner et al., 2017):

- They are brief, subtle, and often occur somewhat regularly
- They can be deliberate or unintended
- They often are not recognized as being hurtful by the perpetrator
- They can occur through verbal statements, behaviors, or environmental cues
- They are perceived as insulting or derogatory
- They are often directed at under represented populations

Unless we pay attention closely, we may not notice when microaggressions occur in our classrooms. We also might notice these incidents, but not think about their effects on some of the students in our classrooms. Whereas each individual microaggression may seem trivial, we must remember that over time, the occurrence of many microaggressions can be extremely traumatic (Suarez-Orozco et al., 2015). Over time, microaggressions can adversely affect one's overall well-being, self-esteem, levels of stress, and physical health (Keels et al. 2017; Nadal et al., 2017; Ong et al., 2013; Rivera et al. 2016; Wong-Padoongpatt et al., 2017).

Table 12.4 lists some examples of microaggressions. As you read through these examples, think about how they might be perceived as a microaggression by some students, yet as harmless by others.

Table 12.4 Examples of Microaggressions

Microaggression	Why Is This a Microaggression?
Mark is a Black 14-year-old. When he is in the candy store with his friend Carrie (who is White), he feels like he is being watched by the sales clerk. Carrie says *"You're just being paranoid."*	Mark has often experienced being watched while walking through stores. Carrie's comment makes Mark feel as though his experiences are not respected as being legitimate.
Amy says to Jeff (who is adopted), *"Do you know your real parents?"*	This statement seems to be a simple question to Amy, but Jeff may find this to be insulting, embarrassing, or mean; it implies that his adopted parents are not his "real" parents.
Students at Fletcher High school are allowed to leave school early to attend a Christian rally at a nearby church. The non-Christian students (who account for only 10% of the students) must remain at school. Those students feel as though they are being punished.	Whereas most of the students and teachers probably don't see this as problematic, the students who must remain at school may feel as though they are being punished for not being part of the majority religious group.
James is a student of Puerto Rican descent, and he attends a primarily White elementary school. When the class is learning about Spanish-speaking countries, the teacher asks James several questions about Puerto Rico, before directing those questions to the other students in the class.	James has lived in the United States for his entire life. He feels as though he is being singled out as having expertise on this topic, merely due to his ethnic heritage.

SOURCES: Baden, 2016; Carter Andrews, 2012; Sue, 2017.

There are several strategies that teachers can use to identify, correct, and prevent the occurrence of microaggressions. First, if this type of interaction occurs in your classroom, try to focus on the content of the microaggression, rather than on the perpetrator. For example, in the example about Amy and Jeff, the teacher might pull Amy aside and focus on the content of her question, pointing out that Jeff has known only his adoptive parents throughout his life, and that for adopted children, adoptive parents are their "real parents."

Second, take the time to learn about diverse students in your classes. This includes learning about the experiences of diverse populations (e.g., the experiences of being an Asian American female in a predominantly White class, or the experiences of having a physical disability while spending all day in a classroom with non-disabled students), as well as learning about the unique experiences of the actual students in your class. When teachers take the time to really understand the lives of their students, they will be less likely to focus on the students' unique status (e.g., when James' teacher assumed that he would be knowledgeable about Puerto Rico and be eager to share that information) either consciously or inadvertently.

Third, don't speak to the perpetrator or other students on behalf of the victim of the microaggression. If a student in your class makes an inappropriate but seemingly harmless comment about a student (Tony) being overweight, don't speak on behalf of Tony and tell the perpetrator how Tony feels; rather, focus on the content of the microaggression and how it can be perceived by others as being hurtful.

Fourth, if you realize that you committed a microaggression against one of your students (or a colleague or a parent), you should apologize to the victim. Moreover, you should take the time to reflect on the incident, and to think about why you might have unintentionally committed a microaggression, and how you can avoid doing this again in the future (Clay, 2017).

Peer Mediation Another approach to addressing conflicts between students is to provide training in **peer mediation**, in which students *help one another* solve interpersonal problems. In this approach, students learn how to mediate conflicts among classmates by asking opposing sides to express their differing points of view and then work together to devise a reasonable resolution (Beaulieu et al., 2013; M. Deutsch, 1993; Johnson & Johnson, 1996, 2006). In one study involving several second- through fifth-grade classrooms (Johnson et al., 1995), students were trained to help peers resolve interpersonal conflicts by asking the opposing sides to do the following:

1. Define the conflict (the problem).
2. Explain their own perspectives and needs.
3. Explain the other person's perspectives and needs.
4. Identify at least three possible solutions to the conflict.
5. Reach an agreement that addresses the needs of both parties.

Teach students strategies for effectively mediating classmates' interpersonal conflicts.

Students took turns serving as mediator for their classmates, such that everyone had experience resolving the conflicts of others. As a result, the students more frequently resolved their *own* interpersonal conflicts in ways that addressed the needs of both parties, and they were less likely than students in an untrained control group to ask for adult intervention.

In peer mediation, then, we see another example of Vygotsky's notion that many effective cognitive processes have their roots in social interactions. In a peer mediation session, students model effective conflict resolution skills for one another, and they may eventually internalize the skills they use in solving others' problems to solve their *own* problems.

Peer mediation is most effective when students of diverse ethnic backgrounds, socioeconomic groups, and achievement levels all serve as mediators (Casella, 2001a;

Williams, 2001b). It's appropriate primarily for small, short-term interpersonal problems, such as hurt feelings or conflicts over use of limited academic resources. Even the most proficient of peer mediators may be ill prepared to handle conflicts that involve deep-seated and emotionally charged attitudes and behaviors (Casella, 2001a). In such cases, the guidance and intervention of adults will be necessary.

Teaching Self-Regulation Skills

Sometimes students simply need guidance in how they might better control their own behaviors. Consider these examples:

- Bradley's performance on assigned tasks is usually rather poor. You know he's capable of better work because he occasionally submits assignments of very high quality. The root of Bradley's problem seems to be that he's off task most of the time—sketching pictures of sports cars, mindlessly fiddling with objects he's found on the floor, or daydreaming. Bradley would really like to improve his academic performance but doesn't seem to know how to do it.
- Ruby often talks without permission—for instance, blurting out answers to questions, interrupting classmates who are speaking, and initiating off-task conversations at inopportune times. You've spoken with Ruby about the problem on several occasions, and she always vows to exercise more self-control in the future. Her behavior improves for a day or so, but after that her mouth is off and running once again.

Bradley's off-task behavior interferes with his own learning, and Ruby's excessive chattiness interferes with the learning of her peers. Cueing and private discussions haven't led to any improvement but both Bradley and Ruby have something going for them: They *want* to change their behavior.

In Chapter 8, we discussed beneficial effects of teaching students how to use more effective self-regulation strategies in terms of their learning. We can use similar strategies to teach students to use self-regulation strategies to improve behavioral problems as well. Particularly when students express concern about their problem behaviors, teaching self-regulation skills can be helpful. One valuable skill is *self-monitoring*, especially when students need a reality check about the severity of a problem. For example, Bradley may think he's on task far more often than he really is; we might give him a timer set to beep every five minutes and ask him to write down whether he's been on task each time he hears a beep. Similarly, Ruby may not realize how frequently she prevents her classmates from speaking; we might ask her to make a check mark on a tally sheet every time she talks without permission.

If self-monitoring alone doesn't do the trick, *self-instructions* might help Ruby gain some self-restraint in class discussions:

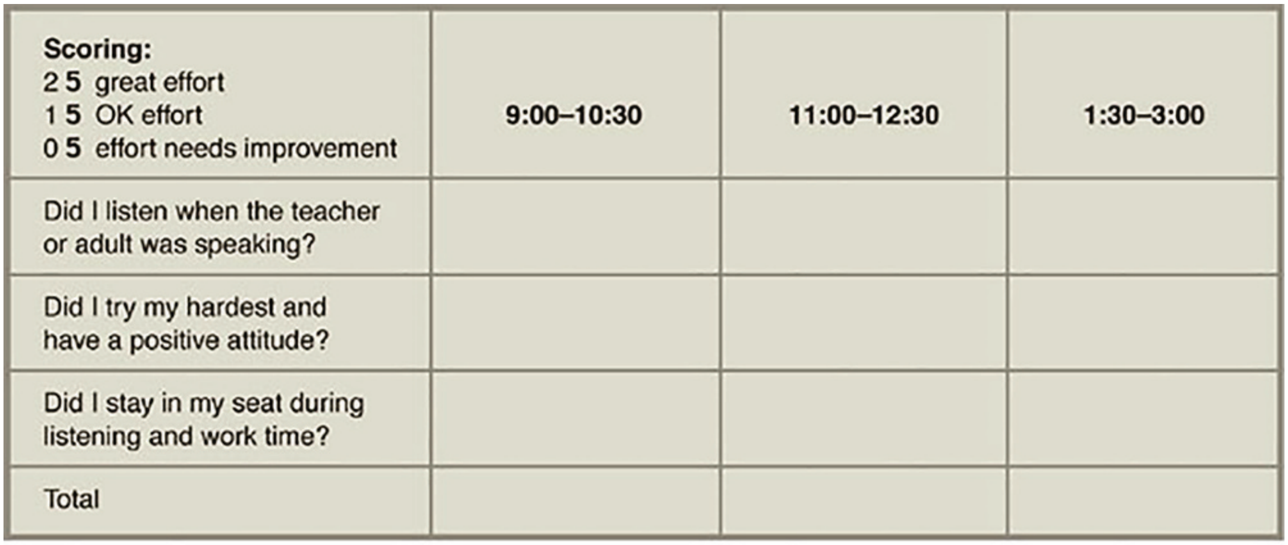
1. *Button* my lips (by holding them tightly together).
2. *Raise* my hand.
3. *Wait* until I'm called on.

Encourage self-regulation by teaching such strategies as self-monitoring, self-instructions, and self-imposed contingencies.

In addition, both students might use *self-imposed contingencies* to give themselves a motivational boost. For example, Bradley might award himself a point for each 15-minute period he's been on task. Ruby might give herself 5 points at the beginning of each school day and then subtract a point each time she speaks out of turn. By accumulating a certain number of points, the two students could earn opportunities to engage in favorite activities.

Self-regulation strategies have several advantages. They help us avoid power struggles with students about who's in charge. They increase students' sense of autonomy and, thus, increase their intrinsic motivation to learn and achieve in the classroom. When students notice that their own behaviors have improved, the

Figure 12.7 A tool to help students to monitor their own classroom behavior.



Scoring: 2 5 great effort 1 5 OK effort 0 5 effort needs improvement	**9:00–10:30**	**11:00–12:30**	**1:30–3:00**
Did I listen when the teacher or adult was speaking?			
Did I try my hardest and have a positive attitude?			
Did I stay in my seat during listening and work time?			
Total			

self-regulation strategies are positively reinforced, thus increasing the likelihood that the students will continue to use those strategies in the future. And when we teach students to monitor and modify their own behavior, rather than depend on us to do it for them, we become free to do other things—for example, to teach! Figure 12.7 is an example of a tool that teachers can provide to students so they can practice monitoring their own behavior.

Conferring with Parents

We may sometimes need to consult with students' parents or other primary caregivers about a serious or chronic behavior problem. Consider these situations:

- You give your students short homework assignments almost every night. Carolyn has turned in only about one-third of them. You're pretty sure she's capable of doing the work, and you know from previous parent–teacher conferences that her parents give her the time and support she needs to get assignments done. You've spoken with Carolyn several times about the problem, but she shrugs you off as if she doesn't really care whether she does well in your class.
- Students have often found things missing from their desks or personal storage bins shortly after Matt has been in the vicinity. A few students have told you that they've seen Matt take things that belong to others, and many of the missing objects have later turned up in Matt's possession. When you confront him about your suspicion that he's been stealing from classmates, he adamantly denies it. He says he has no idea how Cami's gloves or Ryan's baseball trading cards ended up in his desk.

Confer with parents about chronic problems that have serious implications for students' long-term success.

Conferring with parents is especially important when students' behavior problems show a pattern over time and have serious implications for students' long-term academic or social success. In some cases, a simple telephone call may be sufficient. For example, Carolyn's parents may be unaware that she hasn't been doing her homework (she's been telling them she doesn't have any) and may be able to take the steps necessary to ensure that it gets done. In other cases, a conference may be necessary. For example, you may want to discuss Matt's suspected thefts with both Matt and his parent(s) together—something you can do more effectively when you all sit face to face in the same room.

Experiencing Firsthand

Putting Yourself in a Parent's Shoes

Imagine you're the parent of a seventh grader named Kenneth. As you and Kenneth are eating dinner one evening, you get a telephone call.

You: Hello?

Ms. J.: This is Ms. Johnson, Kenneth's teacher. May I talk with you for a few minutes?

You: Of course. What can I do for you?

Ms. J.: Well, I'm afraid I've been having some trouble with your son, and I thought you should know about it.

You: Really? What's the problem?

Ms. J.: Kenneth hardly ever gets to class on time. When he does arrive, he spends most of his time talking with friends rather than paying attention to what I'm saying. It seems as if I have to speak to him three or four times every day about his behavior.

You: How long has all this been going on?

Ms. J.: For several weeks now. And the problem's getting worse rather than better. I'd really appreciate it if you'd talk with Kenneth about the situation.

You: Thank you for letting me know about this, Ms. Johnson.

Ms. J.: You're most welcome. Good night.

You: Good night, Ms. Johnson.

Take a few minutes to jot down some of the things that, as a parent, you might be thinking after this conversation.

Some ways of talking with parents are far more effective than others. Put yourself in a parent's shoes in the exercise given above.

You may have had a variety of thoughts, possibly including these:

- Why isn't Kenneth taking his schoolwork more seriously?
- Isn't Kenneth doing anything *right*?
- Has Ms. Johnson tried anything besides reprimanding Kenneth for his behavior? Or is she laying all of this on *my* shoulders?
- Kenneth's a good kid. I should know, because I raised him. For some reason Ms. Johnson doesn't like him and so is finding fault with anything he does.

Only the first of these four reactions is likely to lead to a productive response on your part.

Notice how Ms. Johnson focused strictly on the negative aspects of Kenneth's classroom performance. As a result, you (as Kenneth's parent) may possibly have felt anger toward your son or guilt about your ineffective parenting skills. Alternatively, if you remained confident about your son's scholastic abilities and your own ability as a parent, you may have begun to wonder about Ms. Johnson's ability to teach and motivate seventh graders. Sadly, too many teachers reach out to parents only to talk about students' weaknesses—never their strengths—as the following interview with Jamal illustrates:

Adult: Has your grandpa [Jamal's primary caregiver] come to school?

Jamal: Yup, when the teachers call him.

Adult: What did they call him for?

Jamal: The only time they call him is when I am being bad, the teacher will call him, he will come up here and have a meeting with the teacher.

Adult: If you are being good do the teachers call?

Jamal: No. (Kumar et al., 2002, p. 164)

Ideally, a teacher–parent discussion about problem behaviors occurs within the context of an ongoing relationship characterized by mutual trust and respect, and a shared concern for the student's learning and well-being. For example, a phone call to parents is most likely to yield productive results if we already have a good working relationship with them and are sure that they won't overreact with harsh, excessive punishment. Furthermore, when communicating with parents, our overall messages about their child should be positive and optimistic. For instance, we might describe negative aspects of a student's classroom performance within the context of the many things the student does *well*. (Rather than start out by complaining about Kenneth's behavior, Ms. Johnson might have begun by saying that Kenneth is a bright, capable young man with many friends and a good sense of humor.) And we must be clear about our commitment to working *together* with parents to help a student succeed in the classroom. The Into the Classroom feature "Talking with Parents about a Student's Misbehaviors" presents several strategies for effectively approaching parents about a challenging behavior problem.

Conducting Planned, Systematic Interventions

Sometimes problem behaviors are so disruptive and persistent that they require a systematic effort to change them. Consider these situations:

- Tucker finds many reasons to roam about the room—he "has to" sharpen a pencil, "has to" get his homework out of his backpack, "has to" get a drink of water, and so on. As a result, Tucker gets very little work done and often distracts his classmates with his perpetual motion.
- Amelia's verbal abusiveness is getting out of hand. She frequently offends you and your other students with sexually explicit language. You've tried praising her on occasions when she's pleasant to others, and she seems to appreciate your doing so, yet her abusive remarks continue.

Imagine that both Tucker and Amelia are in your class. You've already spoken with each of them about their unacceptable behavior, yet you've seen no improvement. You've suggested self-regulation techniques, but neither student is interested in changing for the better. You've tried putting them in time-out for their actions, but Amelia seems to enjoy the time away from her schoolwork, and Tucker sometimes has a valid reason for getting out of his seat. Although both students' parents are aware of and concerned about their children's classroom behaviors, their efforts at home haven't had an impact. And, after all, these are largely *school* problems rather than home problems. So what do you do now?

Plan a systematic intervention when other, simpler interventions haven't been successful.

When simpler, short-term intervention strategies haven't been productive, individually tailored behaviorist approaches can be quite useful, perhaps in the form of *applied behavior analysis* or *positive behavioral interventions and supports.* Such approaches can be especially effective when combined with other strategies, such as fostering perspective taking, teaching effective social skills, and scaffolding self-regulation. Combining behaviorist principles with other, more cognitively oriented techniques is sometimes called **cognitive behavioral therapy** (e.g., Forman & Barakat, 2011; Platts & Williamson, 2000).

See Chapter 6 for more information about behaviorist approaches to intervention, including applied behavior analysis, functional analysis, and positive behavioral interventions and supports.

Into the Classroom

Talking with Parents about a Student's Misbehaviors

- **Consult with parents if a collaborative effort might bring about a behavior change.**

  At a parent–teacher–student conference, a high school math teacher expresses concern that a student often falls asleep in class. Because the student has a computer and a smartphone, her father speculates that perhaps she's using social media when she should be in bed. He looks at his daughter inquisitively, and her guilty facial expression confirms his suspicion. With the teacher's prompting, the father and the student identify an appropriate policy for home computer and phone use—one that includes moving the computer to another room, where its use can be more closely monitored.

- **Begin with a description of the child's many strengths.**

  In a phone conversation with a student's mother, a teacher describes several areas in which the student has made considerable progress and then asks for advice about strategies for helping the student stay on task and be more conscientious about completing his work.

- **Describe the problem in terms of inappropriate behaviors, not in terms of undesirable personality characteristics.**

  When describing a student's poor record of turning in homework assignments, her teacher says, "Carolyn has turned in only one-third of the homework I've assigned this year. Her attendance record is excellent, so I know she's been healthy, and she's certainly capable of doing the work." At no point does the teacher suggest that Carolyn is lazy, unmotivated, or stubborn.

- **Don't place blame; instead, acknowledge that raising children is rarely easy.**

  When talking with the mother of a middle school student, a teacher mentions that the student seems to be more interested in talking to friends than in getting her schoolwork done. The mother describes a similar problem at home: "Marnie's always been a much more social girl than I ever was. It's like pulling teeth just getting her off the phone to do her homework, and then we end up having a shouting match that gets us nowhere!" The teacher sympathetically responds, "Students seem to become especially concerned about social matters once they reach adolescence. How about if you, Marnie, and I meet some day after school to talk about the problem? Perhaps by working together the three of us can find a way to solve it."

- **Ask for information, and express your desire to work together to address the problem.**

  When a teacher discovers that a student has regularly been taking items from classmates' personal storage bins, she sets up an appointment to meet with the student and his grandmother (the student's primary caregiver). "I like Nolan a lot," she says. "He has a great sense of humor, and his smile often lights up my day. I can't understand why he might want to 'borrow' items from other children without asking them first. His actions have cost him several friendships. Do either of you have any ideas about how we might tackle the problem? I'd like to do whatever I can to help Nolan repair his reputation with his peers."

- **Agree on a strategy.**

  While reviewing a student's academic progress at a parent–teacher conference, an elementary teacher says, "Mark has a tendency to fiddle with things at his desk—for example, twisting paper clips, playing with rubber bands, or making paper airplanes—when he should be getting his work done. As a result, he often doesn't complete his assignments." The student's father replies, "I've noticed the same thing when he works on his homework, but I bring a lot of paperwork home from the office every night and don't have time to constantly hound him to stay on task." The teacher and father talk more about the problem and agree that reinforcement for completed assignments might be helpful. Mark will earn points for high scores that will help him "buy" the new bicycle he's been asking for.

SOURCES: Christenson & Sheridan, 2001; Davis & Yang, 2005; Emmer & Evertson, 2009; Evertson & Emmer, 2009; Miller, 2006; Woolfolk Hoy et al., 2006.

How might we use behaviorist techniques to improve Tucker's behavior? One approach would be to identify one or more effective reinforcers—given Tucker's constant fidgeting, opportunities for physical activity might be reinforcing—and then gradually shape more sedentary behavior. We might also give Tucker a reasonable allotment of "tickets" he can use to "purchase" permission to get out of his seat during class activities. An alternative strategy might be to conduct a *functional analysis* to determine the particular purpose that out-of-seat behaviors serve for Tucker. Perhaps they allow him to avoid difficult tasks or to release the physical energy his body seems to overproduce. If we discover that Tucker acts out only when he expects challenging assignments, we should provide the instruction and support he needs to accomplish those assignments successfully—for example, by teaching him effective learning strategies and coaching him in how to ask for help when he needs it. If, instead, we find that Tucker's hyperactivity emerges in a wide variety of situations, we might suspect a physiological cause and give him numerous opportunities to release pent-up energy during the school day. Finally, Tucker might benefit from instruction and scaffolding regarding general organizational skills—in particular, assembling necessary supplies (notebooks, sharpened pencils, completed homework, etc.) before lessons begin.

Cognitive behavioral therapy could be helpful for Amelia as well. In this case, we might suspect that Amelia lacks the social skills she needs to interact effectively with others; we might therefore begin by teaching her such skills through modeling, role-playing, and so on. Once Amelia has gained some competence in interpersonal skills, we can begin to reinforce her for using them (perhaps with praise, as she has responded well to praise in the past). Meanwhile, the teacher should also punish any relapses into old, abusive behavior patterns (time-outs haven't previously worked with Amelia, but perhaps having her write apology notes to offended parties—a logical consequence—would help to drive home the message that some of her language is inappropriate).

Table 12.5 summarizes the six general strategies we've examined for addressing student misbehaviors, along with the circumstances in which each strategy is likely to be useful.

PRINCIPLES/ASSUMPTIONS

Table 12.5 Strategies for Addressing Inappropriate Classroom Behaviors

Strategy	Situations in Which It's Appropriate	Examples
Ignoring the behavior	The misbehavior is unlikely to be repeated. The misbehavior is unlikely to spread to other students. Unusual circumstances have temporarily elicited the misbehavior. The misbehavior doesn't seriously interfere with learning.	One student discreetly passes a note to another student just before the end of class. A student accidentally drops her books, temporarily distracting other students. An entire class is hyperactive on the afternoon before spring break.
Cueing the student	The misbehavior is a minor infraction but definitely interferes with students' learning. Behavior is likely to improve with a subtle reminder.	A student forgets to close his notebook at the start of a test. Members of a cooperative learning group are talking so loudly that they distract other groups. Several students are exchanging jokes during an independent assignment.
Discussing the problem privately with the student	Cueing has been ineffective in changing the behavior. If made clear, the reasons for the misbehavior might suggest possible strategies for addressing it.	A student is frequently late to class. A student refuses to do certain assignments. A student shows a sudden drop in motivation for no apparent reason.
Promoting self-regulation	The student has a strong desire to improve their behavior.	A student doesn't realize how frequently she interrupts classmates. A student seeks help in learning to control his anger. A student acknowledges that his inability to stay on task is adversely affecting his grades.
Conferring with parents	A chronic behavior problem is likely to interfere with long-term success. The source of the problem may possibly lie outside school walls. Parents are likely to work collaboratively with school faculty to bring about a behavior change.	A student does well in class but rarely turns in homework assignments. A student falls asleep in class almost every day. A student is caught stealing classmates' lunches.
Conducting a planned, systematic intervention	The misbehavior has continued over a period of time and significantly interferes with learning. Other, less intensive approaches (e.g., cueing, private conferences) have been ineffective. The student seems unwilling or unable to use self-regulation strategies.	A student has unusual difficulty sitting still for age-appropriate time periods. A student's obscene remarks continue even though her teacher has spoken with her about the behavior on several occasions. A member of the soccer team displays bursts of anger and aggression that are potentially dangerous to others.

Taking Students' Cultural Backgrounds into Account

As we determine which behaviors are truly unacceptable in our classrooms, we must remember that some behaviors that are seen as inappropriate in some cultures may be quite appropriate in others. In the next exercise, we look at some examples.

The section on cultural and ethnic differences in Chapter 4 can help you with this exercise.

Experiencing Firsthand

Identifying Misbehaviors

As you read each scenario below, consider these questions:

- Would you classify the behavior as a *mis*behavior?
- What cultural group(s) might find the behavior appropriate?
- How might you deal with the behavior?

Scenarios:

1. A student is frequently late for school, sometimes arriving more than an hour after the school bell has rung.
2. Two students are sharing answers as they take a quiz.
3. Several students are exchanging insults that become increasingly derogatory.

Tardiness (Scenario 1) interferes with learning because the student loses valuable instructional time; thus, it might reasonably be construed as a misbehavior. However, a student who is chronically tardy may live in a community that doesn't observe strict schedules and timelines—a pattern common in some Hispanic and Native American communities. Furthermore, arrival time may not be entirely within the student's control; for instance, perhaps the student has household responsibilities or transportation issues that make punctuality difficult. A private conversation with the student, perhaps followed up by a conference with family members, might be the most effective way to determine the root of the problem and identify potential solutions.

Sharing answers during a quiz (Scenario 2) is a misbehavior *if* students have been specifically instructed to do their own work. Because a quiz can help us determine what students have and haven't learned, inaccurate quiz scores affect our instructional planning and thus indirectly affect students' future learning. Although the behavior represents cheating to many people, it may reflect the cooperative spirit and emphasis on group achievement evident in the cultures of many Native American, Polynesian, and Mexican American students. An adverse consequence is in order *if* we have previously explained what cheating is in a way that students understand and *if* we have clearly described the situations in which collaboration is and isn't appropriate—in other words, if the students know full well that their behavior violates classroom policy. But if we *haven't* laid such groundwork, we must take the incident as a lesson for ourselves about what we must do to prevent such behavior from occurring again.

Inappropriately sharing answers also lowers the validity of a quiz score (see Chapter 14 and 15).

Exchanging insults (Scenario 3) might be psychologically harmful for the students involved and might adversely affect the overall classroom climate. Alternatively, however, it might simply be an instance of a playful verbal interaction involving creative one-upmanship common in some Black communities. How we handle the situation depends on the spirit in which the students seem to view the exchange. Their body language—whether they're smiling or scowling, whether they seem relaxed or tense—will tell us a great deal. If the insults truly signal escalating hostilities, immediate intervention is in order—perhaps separating the students, imposing an appropriate consequence, and following up with a private conference. If, instead, the insults reflect creative verbal play, we may simply need to establish reasonable boundaries (e.g., "indoor" voices should be used, racial or ethnic slurs are unacceptable).

Remember that some behaviors that are unacceptable in your culture may be quite acceptable in a student's culture. When these behaviors interfere with instruction, be patient and understanding as you help the student acquire behaviors consistent with school expectations.

Addressing Aggression and Violence at School

Learning Objective 12.4 Describe a three-tiered approach that can effectively reduce aggression and violence in the overall school community, as well as additional strategies you might use to address gang-related hostilities.

In recent years, the news media have focused considerable attention on violent school crime, and especially on school shootings, leading many people to believe that aggression in our schools is on the rise and that school buildings are generally unsafe. Most aggression at school involves minor physical injury, psychological harm (e.g., sexual or racial harassment), or destruction of property (e.g., vandalization of student lockers) (Borum et al., 2010; CDC, 2015; Mayer & Furlong, 2010; Robers et al., 2012; U.S. Department of Education, 2014).

If we consider *only* violent aggression that causes serious injury or death, then school is probably the safest place that young people can be (DeVoe et al., 2005; Garbarino et al., 2002). Although more incidents may occur in larger schools, actual rates of such incidents are not strongly related to school size (Klein & Cornell, 2010). Furthermore, most schools now control access to their buildings, and make use of security cameras. Figure 12.8 includes recent data on how schools in the United States use various security measures.

If we consider *all* forms of aggression (mild as well as severe), then aggression among children and adolescents occurs more frequently at school than at any other location—especially in areas where adult supervision is minimal (e.g., hallways, restrooms, parking lots) (Astor et al., 1999; Casella, 2001b; Finkelhor & Ormrod, 2000). In addition, sometimes teachers are victimized at school, although these instances are not always physical (often they involve intimidation, bullying, or threats) (Anderman et al., 2018; Espelage et al., 2013). The relative prevalence of aggression at school is almost certainly due to two factors. First, children and adolescents spend a great deal of time at school, more so than in any other place except home. Second, the sheer number of students attending even the smallest of schools makes some interpersonal conflict almost inevitable.

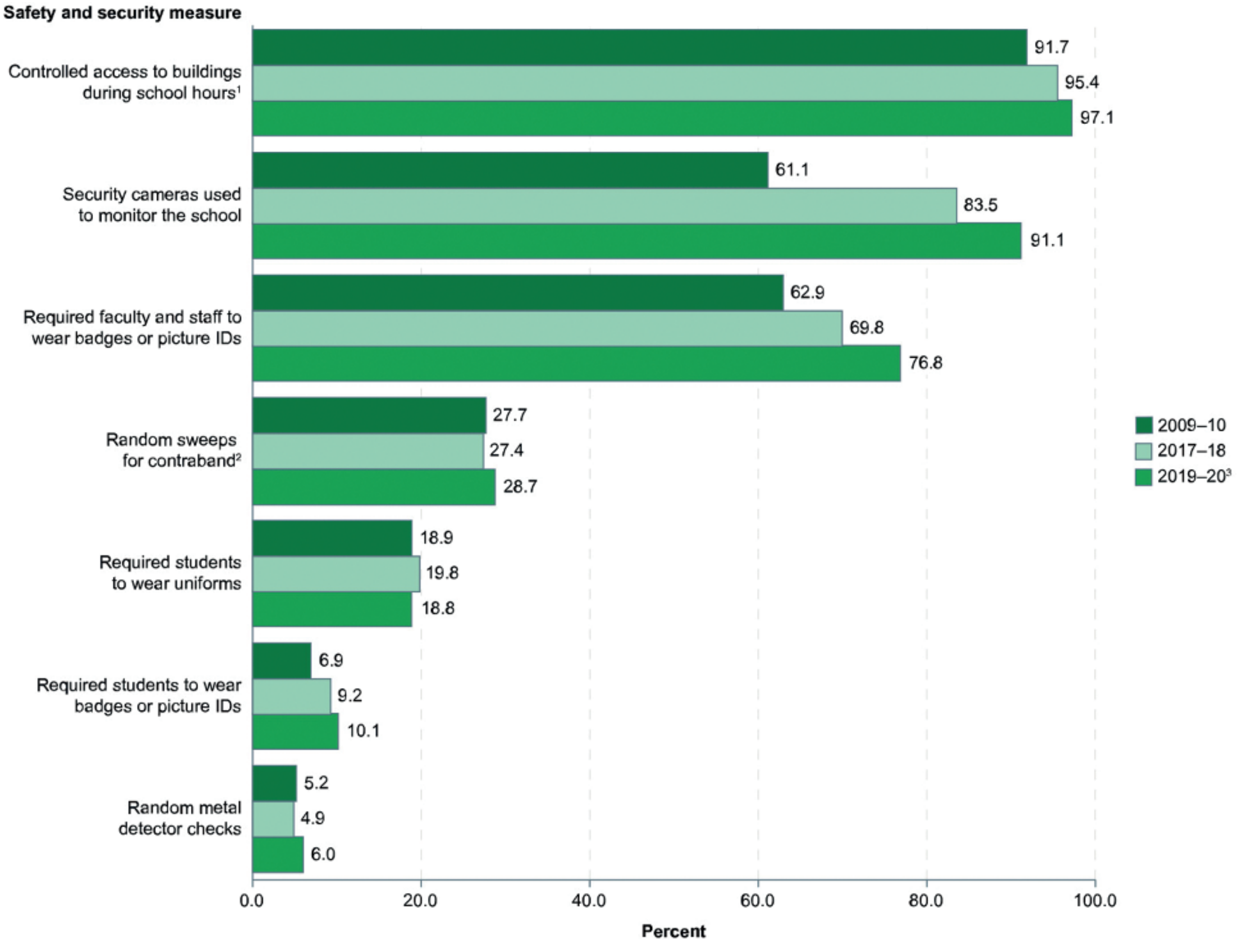
See Chapter 3 for more information about cognitive factors underlying aggression, as well as for recommendations on addressing the causes and emotional consequences of peer bullying.

The roots of school aggression and violence are many and diverse. A variety of cognitive factors (e.g., lack of perspective taking, misinterpretation of social cues, poor social problem-solving skills, emotions, poor academic achievement) predispose some students to aggressive behavior (Coie & Dodge, 1998; Dodge et al., 2003; Estévez et al.. 2019; Savage et al., 2017; Troop-Gordon & Asher, 2005). Furthermore, some school- or neighborhood-specific cultures endorse the belief that defending one's reputation in the face of personal insults or indignities is a matter of "honor" that calls for aggressive action (Brown et al., 2009; Williams, 2001a). Developmental factors come into play as well; for instance, some young children and a few adolescents have poor impulse control, and in early adolescence an unsettling transition to middle school can lead some students to bully weaker age-mates as a way of gaining social status with peers (Espelage et al., 2003; NCES, 2007; Pellegrini, 2002). Students who identify as LGBTQ+ are particularly vulnerable to being bullied (Poteat et al., 2012; UNESCO, 2021). Finally, aggression is a common reaction to frustration, and some students are repeatedly frustrated in their efforts to be academically and socially successful at school (Bender, 2001; Casella, 2001b; Miles & Stipek, 2006).

Bullying and Cyberbullying

Bullying in school has been defined by the U.S. Department of Education and by the CDC as the occurrence of unwanted aggressive actions by one or more youths (who are not either siblings or dating partners) against another, and that involves some type of power imbalance; these unwanted actions either have been repeated, or are likely to be repeated, and may cause physical, psychological, social, or educational harm (Espelage & Colbert, 2016). Rates of bullying and cyberbullying are somewhat difficult to know with certainty, because there are variations in how educators define bullying, and

Figure 12.8 Percentages of public schools that use selected safety and security measures.



Percentage of public schools that used selected safety and security measures: School years 2009–10, 2017–18, and 2019–20

! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.

[1] Prior to 2017-18, the examples of controlled access to buildings included only "locked or monitored doors" and did not include loading docks.

[2] The 2017-18 and 2019-20 questionnaires included only a single item about random sweeps for contraband, and they provided locker checks and dog sniffs as examples of types of sweeps. Prior to 2017-18, the questionnaire included one item about dog sniffs for drugs, followed by a separate item about sweeps not including dog sniffs. For years priorto 2017-18, schools are trated as using random sweeps for contraband if they answered "yes" to either or both of these items; each school is counted only once, even if it ansered "yes" to both items.

[3] The coronavirus pandemic affected the 2019-20 date collection activities, while the change to virtual schooling and the adjusted school year may have impacted the data collected by SSOCS. Readers should use caution when comparing 2019-20 estimates with those from earlier years. For more information, see Crime, Violence, Discipline, and Safety in U.S. Public Schools in 2019-20: Findings From the School Survey on Crime and Safety (NCES 2022-029).

NOTE: esponses were provided by the principal or the person most knowledgeable about crime and safety issues at the school.

SOURCE: School safety and security measures, https://nces.ed.gov/fastfacts/display.asp?id=334

because some students don't report bullying when it has occurred. In the United States, about 15% of students in the fourth grade (compared to 16% internationally) and 7% of students in the eighth grade (compared to 8% internationally) report being bullied at least once per month (NCES, 2017). Among older adolescents in the United States, 19.5% of high school students report having been bullied at school during the past 12 months (CDC, 2019). Although bullying remains a serious problem in the United States, national attention directed at bullying may have had an impact, as the percentage of students between the ages of 12 and 18 who report being bullied at school dropped by more than 10% between 2007 and 2015; moreover, the percentage of students who indicated that they reported bullying to a teacher or adult increased by 6% (Camera, 2018). Although any student can be bullied, students who are particularly at risk of being bullied are those who differ from the majority in terms of cultural background or gender/sexual identity, as well as students with disabilities (including learning disabilities) (CDC, 2014).

Cyberbullying is bullying that occurs via the use of technology (e.g., social media, text messaging). It is estimated that almost half of U.S. adolescents have experienced cyberbullying (Pew Research Center, 2022), and about 16% of high school students report having experienced cyberbullying within the previous 12 months (National Center for Education Statistics, 2022). Whereas cyberbullying is very similar to general bullying, there are some noteworthy differences that make cyberbullying particularly problematic (Englander et al., 2017; Gámez-Guadix et al., 2013; Gini & Espelage, 2014; Mirsky & Omar, 2015; Vollet et al., 2020):

- Cyberbullying can be done anonymously; a student can post an embarrassing photograph or a hurtful statement about another student without revealing their own identity.
- Whereas traditional bullying often (but certainly not always) occurs at school, cyberbullying can occur anywhere. As teachers, we may not be aware that cyberbullying is occurring, since it is happening within virtual communities that we probably do not have access to.
- Cyberbullying can be particularly harmful to our students. In fact, cyberbullying may be more likely to lead to depression, substance abuse, suicidal ideation, and attempts of suicide than traditional bullying.

Research on the prevention of cyberbullying is emerging. There are many prevention programs and websites available, but as educators, we need to realize that not all of these programs may be effective (Polanin et al., 2022). Research to date suggests that effective cyberbullying prevention programs generally promote internet safety and the responsible use of technology; they emphasize parental monitoring of technology use; and they promote strong school policies about cyberbullying, and partnerships with parents to prevent cyberbullying (Espelage & Hong, 2017). Some research also suggests that cyberbullying prevention programs may be particularly effective when they are presented to students by individuals who are highly knowledgeable about technology, rather than regular teachers (Ng et al., 2022). As teachers, we must do all that we can to prevent cyberbullying, and to provide support to students when it occurs.

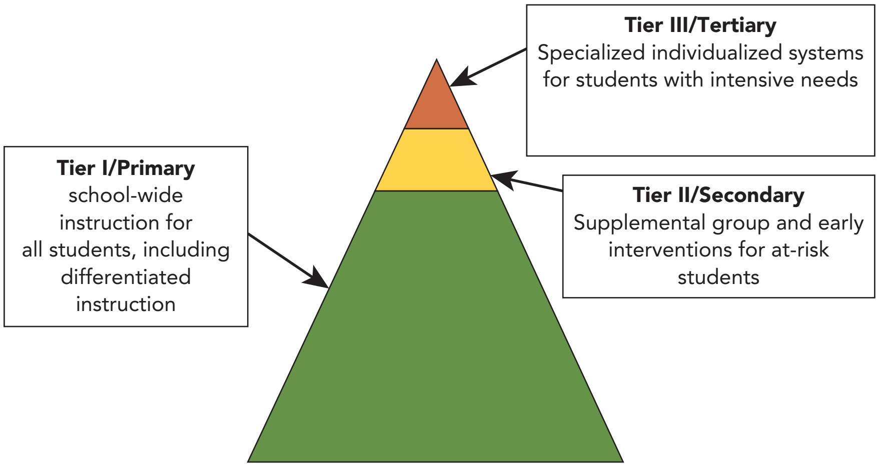
Don't tolerate *any* form of aggression at school. For example, be on the lookout for bullying and other forms of psychological intimidation.

Regardless of the roots of the behavior, we mustn't tolerate *any* form of aggression or violence on school grounds or via social media. Students can learn and achieve at optimal levels only if they know they're both physically and psychologically safe at school and online. And if they *don't* feel safe, they're at increased risk for dropping out before high school graduation (Filax, 2007; Peguero & Bracy, 2014). To be truly effective in combating aggression and violence, we must address these challenges on three levels (Dwyer & Osher, 2000; Hyman et al., 2006; Ihlo & Nantais, 2010; Walker et al., 1996), which essentially parallel the core components of the systemic approach to the promotion of positive behavior referred to as **Positive Behavioral Intervention Supports** (**PBIS**, also referred to as **SWPBIS** when these practices are implemented on a *schoolwide* level), which we introduced in Chapter 5 in our discussion of students with special needs. The three tiers are depicted graphically in Figure 12.9 (www.Youth.gov, 2018). Research suggests that this tiered approach is quite effective at promoting positive behaviors (Freeman et al., 2015; Lee et al., 2021; Öğülmüş & Vuran, 2016; Sprague & Horner, 2006; Sugai & Horner, 2002). This approach is now widely used in many thousands of schools in the United States (Bradshaw et al., 2010; PBIS Technical Assistance Center, 2018a). PBIS and SWPBIS approaches can be implemented at all school levels, and educators who work in high schools with significant bullying problems seem to implement PBIS approaches to bullying prevention with good fidelity (Bradshaw et al., 2015).

TIER I: Primary/Universal Schoolwide Efforts to Prevent Bad Behavior One-shot "antiviolence" campaigns have little lasting effect on school aggression and violence (Burstyn & Stevens, 2001). Instead, creating a peaceful, nonviolent school environment must be a long-term effort that includes numerous strategies:

- Make a schoolwide commitment to supporting *all* students' academic and social success.
- Provide a challenging and engaging curriculum—always keep the focus on the academics; address cases of academic disengagement promptly.

Figure 12.9 A three-tier approach to promoting positive behavior in schools.

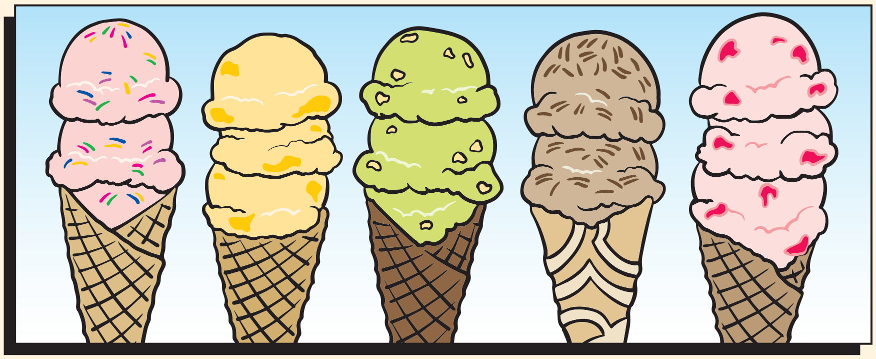

Tier III/Tertiary
Specialized individualized systems for students with intensive needs
Tier I/Primary
school-wide instruction for all students, including differentiated instruction
Tier II/Secondary
Supplemental group and early interventions for at-risk students

SOURCE: www.Youth.gov, (2018) Improvement. Downloaded March 17, 2018, from https://youth.gov/youth-topics/school-climate/how-to-improve-school-climate

- Form caring, trusting faculty–student relationships.
- Insist on genuine and equal respect—among students and faculty alike—for people of diverse backgrounds, races, and ethnic groups.
- Emphasize prosocial behaviors (e.g., sharing, helping, cooperating), perhaps through the use of cooperative learning (which will be discussed in greater detail in Chapter 13) (Van Ryzin & Roseth, 2018). Figure 12.10 depicts an example of a schoolwide reward system fostering good behavior.
- Establish classroom-specific and schoolwide policies and practices that foster appropriate behavior (e.g., give clear guidelines for behavior, consistently apply consequences for infractions, provide instruction in effective social interaction and problem-solving skills, implement clear policies forbidding cyberbullying). Make sure that classroom and school policies are aligned.

Figure 12.10 A school-wide reward system for supporting positive behaviors.

ICE CREAM!!!



There will be an ice-cream party on Monday, May 1st, at 3:00, recognizing good behavior!

You can attend if during the month of April:

- You did not receive any detentions or referrals.
- You did not have any unexcused absences.
- You have not been tardy to class.

- Teach specific skills that students can use to intervene when they witness bullying (either in person or via social media).
- Provide mechanisms through which students can communicate their concerns about aggression and victimization openly and without fear of reprisal.
- Involve students in school decision making.
- Adopt ongoing violence and bullying prevention programs that are supported by solid research.
- Establish close working relationships with community agencies and families.
- Openly discuss safety issues. (Burstyn & Stevens, 2001; Dwyer & Osher, 2000; Fink et al., 2018; Learning First Alliance, 2001; Meehan et al., 2003; G. M. Morrison et al., 2004; Pellegrini, 2002; Ross & Horner, 2009; Rucinski et al., 2018; Savage et al., 2017; Syvertsen et al., 2009; Warren et al., 2006)

Most of these strategies should look familiar, as they've been mentioned frequently throughout this and other chapters of the book. The final strategy on the list—openly discussing safety issues—encompasses a variety of more specific strategies, such as these:

- Explain what bullying and cyberbullying are (i.e., that they involve harassing and intimidating peers who can't easily defend themselves) and why they are unacceptable.
- Solicit students' input about potentially unsafe areas on school grounds that require more faculty supervision (e.g., an infrequently used restroom or back stairwell).
- Convey willingness to hear students' complaints about troublesome classmates. (Such complaints can provide important clues about which students most need assistance and intervention.)
- Most important, take active steps to *address* students' safety concerns.

TIER II: Targeted Intervening Early for Students at Risk Usually, when educators use the term *students at risk,* they're referring to students who are at risk for academic failure. But students can be at risk for *social* failure as well. For instance, they may have few or no friends, be overtly bullied or rejected by many of their peers, or in other ways find themselves excluded from the social life of the school. Social failure can also include those students who are the perpetrators of violence and bullying, who can benefit from intervention.

Perhaps 10% to 15% of students need some sort of minor intervention to help them interact effectively with peers, establish good working relationships with teachers, and become bona fide members of the school community (Ihlo & Nantais, 2010; Lane et al., 2011). Such intervention can't be a one-size-fits-all approach but must instead be tailored to students' particular strengths and needs. For some students, it might require instruction in effective social skills. For other students, it might mean getting them actively involved in school clubs or extracurricular activities. For still others, it may require a well-planned, systematic effort to encourage and reinforce productive behaviors, perhaps through applied behavior analysis or positive behavioral interventions and supports. Regardless of type, interventions are most effective when they occur *early* in the game—before students go too far down the path of antisocial behavior—and when they're developed by a multidisciplinary team of teachers and other professionals who bring various areas of expertise to the planning table (Crone et al., 2004; Dwyer & Osher, 2000; Osher et al. al., 2010).

TIER III: Providing Intensive Intervention for Students in Trouble (Tertiary Supports) For a variety of reasons, minor interventions aren't always sufficient for a small percentage of students who are predisposed to be aggressive and violent. For example, some students have serious mental illnesses that interfere with their ability to think rationally, cope appropriately with everyday frustrations, and control impulses. Typically, schools must work closely and collaboratively with other community groups—perhaps mental health clinics, police and probation officers, and social services—to help students at high risk for aggression and violence (Dwyer & Osher, 2000; Greenberg et al., 2003; Hyman et al., 2006).

Keep the common warning signs of violence in mind. Use them as possible indicators that a student needs significant assistance to gain emotional well-being and social success.

As teachers, our frequent interactions with students put us in an ideal position to identify those students most in need of intensive intervention and get them back on track. As you gain teaching experience, you'll begin to get a good sense of which

Figure 12.11 Early warning signs of possible violent behavior.

Experts have identified numerous warning signs that a student may possibly be contemplating violent actions against others. Any one of them alone is unlikely to signal a violent attack, but several of them *in combination* should lead us to consult with school administrators and specially trained professionals.

- *Social withdrawal:* Over time, a student interacts less and less frequently with teachers and with all or most peers.
- *Excessive feelings of isolation, rejection, or persecution:* A student directly or indirectly expresses the belief that he or she is friendless, disliked, or unfairly picked on; such feelings are sometimes the result of long-term physical or psychological bullying by peers.
- *Rapid decline in academic performance:* A student shows a dramatic change in academic performance and seems unconcerned about doing well. Cognitive and physical factors (e.g., learning disabilities, ineffective study strategies, brain injury) have been ruled out as causes of the decline.
- *Poor coping skills:* A student has little ability to deal effectively with frustration, takes the smallest affront personally, and has trouble bouncing back after minor disappointments.
- *Lack of anger control:* A student frequently responds with uncontrolled anger to even the slightest injustice and may misdirect anger at innocent bystanders.
- *Apparent sense of superiority, self-centeredness, and lack of empathy:* A student depicts himself or herself as smarter or in some other way better than peers, is preoccupied with his or her own needs, and has little regard for the needs of others. Underlying such characteristics may be low-esteem and depression.
- *Lengthy grudges:* A student is unforgiving of others' transgressions, even after considerable time has elapsed.
- *Violent themes in drawings and written work:* Violence predominates in a student's artwork, stories, or journal entries, and perhaps certain individuals (e.g., a parent or particular classmate) are regularly targeted in these fantasies. (Keep in mind that *occasional* violence in writing and art isn't unusual, especially for boys.)
- *Intolerance of individual and group differences:* A student shows intense disdain and prejudice toward people of a certain race, ethnicity, gender, sexual orientation, religion, or disability.
- *History of violence, aggression, and other discipline problems:* A student has a long record of seriously inappropriate behavior extending over several years.
- *Association with violent peers:* A student associates regularly with a gang or other antisocial peer group.
- *Inappropriate role models:* A student speaks with admiration about Satan, Adolf Hitler, Osama bin Laden, the Boston bombers, or some other malevolent figure.
- *Excessive alcohol or drug use:* A student who abuses alcohol or drugs may have reduced self-control. In some cases substance abuse signals significant mental illness.
- *Inappropriate access to firearms:* A student has easy access to guns and ammunition and may regularly practice using them.
- *Threats of violence:* A student has openly expressed an intent to harm someone else, perhaps in explicit terms or perhaps through ambiguous references to "something spectacular" happening at school on a particular day. ***This warning sign requires immediate action***.

SOURCES: American Psychological Association, 2022; Dwyer et al., 1998; O'Toole, 2000; U.S. Secret Service National Threat Assessment Center, 2000; Watson et al., 2005.

characteristics are and aren't normal for a particular age-group. You should especially be on the lookout for the early warning signs of violence presented in Figure 12.11.

Although we must be ever vigilant for signals that a student may be planning to cause harm to others, it's essential that we keep several points in mind. First, as mentioned earlier, extreme violence is *very rare* in schools; unreasonable paranoia about potential school violence will prevent us from working effectively with students. Second, the great majority of students who exhibit one or a few of the warning signs listed in Figure 12.11 *won't* become violent (U.S. Secret Service National Threat Assessment Center, 2000). And most important, we must *never* use the warning signs as a reason to unfairly accuse, isolate, or punish a student (Dwyer et al., 1998). These signs provide a means of getting students help if they need it, not of excluding them from the education that all children and adolescents deserve.

Addressing Gang-Related Problems

A frequent source of aggression at some schools is gang-related hostilities. Although gangs are more prevalent in low-income, inner-city schools, they're sometimes found in suburban and rural schools as well (Howell & Lynch, 2000; Kodluboy, 2004). It is important to remember that membership in a gang does not necessarily mean that such students will behave violently at school or solely interact with other gang members (Estrada et al. 2014; Gebo & Sullivan, 2014).

The three-level approach to combating school aggression and violence just described can go a long way toward suppressing violent gang activities, but we'll often need to take additional measures as well. Recommended strategies include these:

- Develop, communicate, and enforce clear-cut policies regarding potential threats to other students' safety.
- Identify the specific nature and scope of gang activity in the student population.

- Consult with school and community support services to mediate between-gang and within-gang disputes.
- Forbid clothing, jewelry, and behaviors that signify membership in a particular gang (e.g., bandanas, shoelaces in gang colors, certain hand signs).[1]

As should be apparent from our discussion in this chapter, helping students develop into successful, productive adults can occasionally be quite a challenge. But in our own experiences, discovering that you actually *can* make a difference in students' lives—including the lives of some who are at risk for academic or social failure—is one of the most rewarding aspects of being a teacher.

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[1] A potential problem with this strategy is that it may violate students' civil liberties. For guidance on how to walk the line between ensuring students' safety and giving them reasonable freedom of expression, see Kodluboy (2004), Rozalski and Yell (2004), and Warnick (2012).

Chapter 12 What Have You Learned?

We now return to the chapter's learning objectives to review some of the chapter's key ideas.

12.1 Describe numerous strategies for creating a classroom environment conducive to academic achievement and students' personal well-being. Effective teachers create a setting in which students are regularly engaged in planned tasks and activities and in which few student behaviors interfere with those tasks and activities. The physical arrangement of the classroom makes a difference, but more important is a psychological environment—*classroom climate*—in which students feel safe and secure, make learning a high priority, and are willing to take academic risks and make mistakes. Central to such a climate are (1) teacher–student relationships that communicate genuine caring and concern for every student and (2) an overall sense of community in the classroom and school—a sense that teachers and students have shared goals, are mutually respectful and supportive, and believe that everyone makes an important contribution to learning. Creating a warm, supportive atmosphere and a sense of classroom community may be especially important for students in diverse cultural groups, students from lower socioeconomic backgrounds, and students with disabilities. At the same time, we teachers must take charge to some extent, establishing rules and planning age-appropriate activities to ensure that students are continually working toward instructional goals and objectives.

12.2 Explain how you can coordinate your efforts with colleagues, community agencies, and parents to maximize students' academic and personal development. As teachers, we'll be most effective when we work cooperatively with other faculty, other organizations, and parents to promote students' learning, development, and achievement. It's especially important to keep in regular contact with parents, sharing information in both directions about students' progress, and coordinating efforts at school with those at home. We can keep the lines of communication open through a variety of mechanisms—for instance, through conferences, newsletters, websites, text messages, and family activities at school. We may need to make an extra effort to establish productive working relationships with those parents who, on the surface, seem reluctant to become involved in their children's education.

12.3 Identify six general approaches to dealing with student misbehaviors and the circumstances and cultural contexts in which each approach might be appropriate. Despite our best efforts, students sometimes engage in behaviors that disrupt learning, put one or more students' physical safety or psychological well-being in jeopardy, or violate basic moral and ethical standards. Some minor misbehaviors are best ignored, including those that probably won't be repeated, those that are unlikely to be imitated by other students, and those that occur only temporarily and within the context of unusual circumstances. Other minor infractions can be dealt with simply and quickly by cueing students or talking privately with them. More serious and chronic behavior problems may require instruction in self-regulation skills, consultation with parents, or intensive, multifaceted interventions. Regardless of the approach we use in dealing with students' misbehaviors, we must take into account the fact that some of those behaviors may be the product of a particular cultural upbringing or the result of a specific disability.

12.4 Describe a three-tiered approach that can effectively reduce aggression and violence in the overall school community, as well as additional strategies you might use to address gang-related hostilities. Although violent crime in schools is on the decline, milder forms of aggression (e.g., minor physical injuries, psychological harm, destruction of property) continue to be common in and around schools. Some experts recommend a three-level approach to combating aggression and violence in schools. First, collaboratively create a schoolwide environment that makes aggression and violence unlikely—for instance, by establishing trusting teacher–student relationships, and fostering a sense of caring and respect among students from diverse backgrounds. Second, we must intervene early for students who appear to be at risk for academic or social failure, providing them with the cognitive and social skills they need to be successful. And third, we must seek intensive intervention for a small number of students who are prone to violence, have a disabling mental illness, or in some other way are seriously troubled. If well-organized gangs have a significant presence in our schools, we may need to take additional measures as well.

Practice for Your Licensure Exam

The Good Buddy

Mr. Schulak has wanted to be a teacher for as long as he can remember. In his many volunteer activities over the years—coaching a girls' basketball team, assisting with a Boy Scout troop, teaching Sunday school—he has discovered how much he enjoys working with children. Children obviously enjoy working with him as well: Many occasionally call or stop by his home to shoot baskets, talk over old times, or just say hello. Some of them even call him by his first name.

Now that Mr. Schulak has completed his college degree and obtained his teaching certificate, he has accepted a teaching position at his hometown's middle school. He's delighted to find that he already knows many of his students, and he spends the first few days of class renewing his friendships with them. But by the end of the week, he realizes that his classes have accomplished little of an academic nature.

The next Monday, Mr. Schulak vows to get down to business. He begins each of his five class sessions by describing his instructional goals for the weeks to come and then introduces the first lesson. Unfortunately, many of his students are resistant to settling down and getting to work. They want to move from one seat to another, talk with friends, use their phones, toss wadded-up paper "basketballs" across the room, and do anything *except* the academic tasks Mr. Schulak has in mind. In his second week as a new teacher, Mr. Schulak has already lost control of his classes.

1. **Constructed-response question:**

   Mr. Schulak is having considerable difficulty bringing his classes to order.

   A. Identify two critical things that Mr. Schulak has *not* done to get the school year off to a good start.

   B. Describe two strategies that Mr. Schulak might now use to remedy the situation.

2. **Multiple-choice question:**

   Mr. Schulak is undoubtedly aware that good teachers show that they care about and respect their students. Which one of the following statements describes the kind of teacher–student relationship that is most likely to foster students' learning and achievement?

   a. The teacher communicates optimism about students' potential for success and offers the support necessary for that success.

   b. The teacher spends a lot of time engaging in recreational activities with students after school and on weekends.

   c. The teacher focuses almost exclusively on what students do well and ignores or downplays what students do poorly.

   d. The teacher listens patiently to students' concerns but reminds them that he or she alone will ultimately decide what transpires in the classroom.

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 13

Instructional Strategies

Monkey Business/Fotolia

Learning Objectives

13.1 Explain general principles that can guide your planning and instructional strategies.

13.2 Describe important elements of instructional planning, and explain how and why planning and instruction must be closely intertwined.

13.3 Explain how you can effectively promote students' learning through teacher-directed instructional strategies.

13.4 Explain how you can also promote students' learning through more learner-directed strategies.

13.5 Apply your knowledge of learning, cognition, and effective instructional practices to various academic content domains.

13.6 Choose appropriate instructional strategies for varying instructional goals and different kinds of students.

CASE STUDY

Westward Expansion

Mr. Quinn's sixth-grade class is studying westward expansion in North America during the middle 1800s. Today's lesson is about a typical journey west in a covered wagon. Mr. Quinn begins by projecting a 19th-century U.S. map on a screen at the front of the room. "Many people traveled by steamship up the Missouri River to the town of Independence," he says, and he uses a pointer to trace the route on the map. "Then they continued west in a covered wagon until they reached their final destination—maybe Colorado or California." He now shows several old photographs of people traveling in covered wagons and says, "A typical covered wagon was about 4 feet wide and maybe 10 or 12 feet long." He has two students use tape to mark a 4-by-10-foot rectangle on the carpet. "How much room would a wagon with these dimensions give you for your family and supplies?" The students agree that people would have to be quite choosy about what they brought with them on the trip west.

"All right," Mr. Quinn continues, "let's think about the kinds of things you would need to pack in your wagon. Let's start with the kinds of food you'd want to bring and how much of each type you should pack." He divides the students into groups of three or four members each and has them brainstorm what might be a reasonable grocery list. After a few minutes, he writes each group's suggestions on the board.

At this point, Mr. Quinn clicks on an internet link and projects an electronic copy of John Lyle Campbell's pamphlet, *Idaho: Six Months in the New Gold Regions: The Emigrant's Guide,* published in 1864. "This pamphlet provided advice for a party of four men who might be traveling west to seek their fortunes in the quartz mining boom in Idaho." The pamphlet lists many things that the students haven't thought of and suggests much larger amounts than the students have estimated. For example, it recommends 12 sacks of flour, 400 pounds of bacon, 100 pounds of coffee, 15 gallons of vinegar, 50 pounds of lard, and "one good cow for milking purposes."

"What do you think about the list?" Mr. Quinn asks. "Does it make sense?" The students have varying opinions: "Fifty pounds of lard—eeuuww, gross! Isn't that stuff really bad for your arteries or something?" "We *way* underestimated our flour." "I don't understand why they needed to bring so much coffee." "The cow's a good idea, though."

Mr. Quinn's next question is, "*Why* did people need all these things? Let's talk about that for a bit."

- What specific instructional strategies does Mr. Quinn use to engage and motivate his students? What strategies does he use to help them learn and remember the content of the lesson?

To engage and motivate his students, Mr. Quinn arouses situational interest through a physical activity (students mark a "wagon" on the carpet), creates cognitive dissonance (the list in the pamphlet doesn't entirely match the ones the students have generated), and makes the lesson a very social, interactive one. He promotes learning and understanding, in part, by encouraging visual imagery and elaboration—for example, by making the lesson concrete and vivid (through the old photographs and masking-tape wagon) and by asking students to speculate about why such things as lard and coffee might have been important. He also utilizes technology to present an image of an actual pamphlet from 1864.

Effective instruction requires knowledge and use of **evidence-based practices**—those methods and strategies that research has consistently shown to be successful in helping students learn and achieve. But as teachers, we need to carefully think about when, how, and why we use these strategies. Remember our discussion of metacognition from Chapter 8? When it comes to using evidence-based practices, we teachers need to be metacognitive—we need to think carefully about the instructional strategies that we will use. This requires considerable *planning:* We must decide in advance both what needs to be accomplished and how best to accomplish it, and we must continue to revise our plans—mentally, at least—as a lesson or unit proceeds. Not only are planning and instruction closely connected but they're also intertwined with two other critical aspects of classroom practice: creating a productive environment for learning and assessing students' performance. Furthermore, planning, instruction, the classroom environment, and assessment practices both influence and are influenced by students' characteristics and behaviors. As we make our day-to-day decisions in the classroom, we must *always* take into account what we know about each of our students.

General Principles That Can Guide Instruction

Learning Objective 13.1 **Explain general principles that can guide your planning and instructional strategies.**

Historically, many educators have looked for—and in some cases believe that they have found—the single best way to teach children and adolescents. In reality, *there is no single best approach to instruction.* Instead, effective teachers adhere to several general principles as they plan and carry out instruction.

- *Effective teachers begin their instructional planning by determining what they ultimately want students to know and be able to do.* A popular approach is **backward design**. This approach is particularly effective, because planning and instruction begin with a consideration of where we want our students to be (and what we want our students to have learned) at the completion of a lesson or unit. The steps for backward design follow this sequence: (Tomlinson & McTighe, 2006; Wiggins & McTighe, 2011):

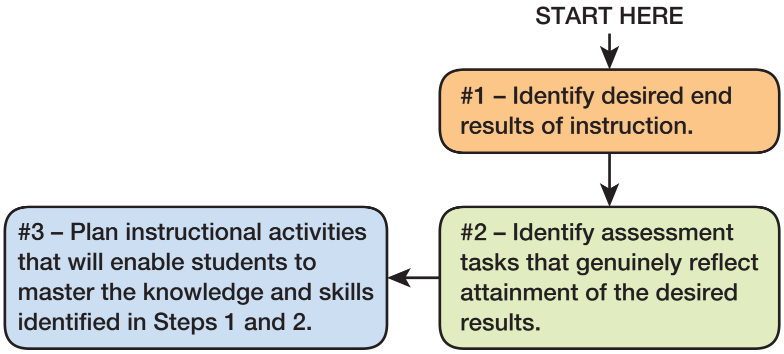
  1. Identify the desired end results in terms of knowledge and skills that students should attain—ideally including meaningful learning, conceptual understanding, and complex cognitive processes.
  2. Determine acceptable evidence—in the form of performance on various assessment tasks—to verify that students have achieved those results.
  3. Plan learning experiences and instructional activities that enable students to master the knowledge and skills identified in Steps 1 and 2.

Chapter 12 presented strategies for creating a productive classroom environment. Chapters 14 and 15 present assessment strategies.

  With such an approach, we essentially *begin at the end* and then choose assessment tasks and instructional strategies that are specifically related to that end (see Figure 13.1). For example, if the objective for a unit on addition is *rapid retrieval* of number facts, we might create a timed quiz to assess students' ability to recall the facts quickly and easily, and employ game-like software to enhance students' automaticity for those facts. But if our objective is *application* of number facts, we may instead want to focus our assessment methods and instructional strategies on word problems or, better still, on activities involving real objects and hands-on measurements.

We will discuss the role of backward design in assessment of student learning in Chapter 14.

Figure 13.1 In a backward-design approach to instructional planning, a teacher mentally travels "backward" in time.


START HERE
#1 – Identify desired end results of instruction.
#2 – Identify assessment tasks that genuinely reflect attainment of the desired results.
#3 – Plan instructional activities that will enable students to master the knowledge and skills identified in Steps 1 and 2.

- *Effective teachers use a variety of instructional strategies, often within a single lesson.* The lesson in the opening case study includes graphic displays presented using technology, a physical activity, a small-group cooperative task, and intriguing questions. This combination of instructional strategies engages students' interest and attention and helps them understand what 19th-century westward migration entailed. Much of the lesson reflects **teacher-directed instruction**, in which a teacher calls most of the shots, choosing which topics will be addressed and structuring students' activities. However, one of Mr. Quinn's strategies—having students develop grocery lists in small groups—reflects **learner-directed instruction**, in which students have considerable control regarding what they do and learn. Some educators use the terms *teacher-centered* versus *learner-centered* in reference to this distinction, but virtually all instructional strategies should focus on students' characteristics and behaviors—for instance, by taking into account what students currently know and don't know, what their needs and motives are, and how instruction can best support their engagement in effective cognitive processes.[1]

When choosing instructional strategies, keep in mind the principles of motivation that were covered in Chapters 10 and 11.

Regardless of the specific terms we use, we must remember that the distinction being made here really reflects a *continuum* rather than an either–or situation, because instructional strategies can vary considerably in the degree to which teachers and students direct the course of events. The relative amounts of teacher and student control can change even within a single lesson. For example, although Mr. Quinn poses specific questions for students to answer—a teacher-directed strategy—the questions are sufficiently open ended that students' responses influence the nature of subsequent discussions.

- *Effective teachers help students make sense of, remember, and apply what they are learning.* Instruction can be effective only to the extent that it actively engages students in thinking about the subject matter; fosters meaningful learning and appropriate conceptual change; and encourages problem solving, critical thinking, and other complex cognitive processes (see Chapter 8). Good instruction also keeps students' cognitive load at a manageable level: At any particular moment, information and cognitive processing demands mustn't exceed students' limited working memory capacity (Mayer, 2011; Sweller, 2010).

  To see this principle in action, try the following exercise.

Experiencing Firsthand

Finding Pedagogy in One of Your Textbooks

1. Look at two or three chapters in this book or another textbook that you've recently read. Identify places where the author has done specific things to help you learn and remember the material more effectively. What specific strategies did the author use to facilitate your cognitive processing?
2. In those same chapters, can you find places where you had trouble making sense of the ideas presented? If so, what might the author have done differently in those instances?

If you've chosen one or more chapters that we authors have written, we're hoping that the Experiencing Firsthand exercises have helped you relate new topics to your own knowledge and experiences. We're hoping, too, that the case studies, and interactive activities have made abstract ideas more concrete and easy to understand. Perhaps some of the tables and graphics have helped you organize concepts and principles.

- *Effective teachers focus on knowledge and skills that are most likely to enhance students' long-term success both in and outside of school.* For example, rather than asking students to memorize trivial facts, effective teachers emphasize general themes, principles, and skills—sometimes known as *big ideas*—that are applicable to many topics

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[1] The American Psychological Association (APA) has identified 14 *Learner-Centered Psychological Principles* that encompass many fundamental principles of human learning, motivation, and development. You can find these principles by going to the APA's website (www.apa.org) and typing "learner-centered principles" in the search box.

(e.g., Brophy et al., 2009; Wiggins & McTighe, 2011). Rather than simply chastising students for failing to complete homework assignments, effective teachers foster metacognitive strategies and self-regulation skills essential for self-guided, independent learning. And rather than filling the entire school day with traditional drill-and-practice exercises, effective teachers often assign **authentic activities** that in some way resemble those that students are likely to encounter in the outside world, thus helping their students to see the value of information that is being taught.

- *Effective teachers provide some structure and scaffolding for activities and assignments.* Even when lessons are largely learner directed, students typically need structure and guidance, especially with new and challenging tasks (e.g., Wise & O'Neill, 2009). The concept of *scaffolding* is useful here: We can provide a great deal of structure for tasks early in the year (or early within a new unit), gradually removing it as students become better able to structure tasks for themselves. For example, when students first engage in cooperative learning activities, we might break down each group task into several subtasks, giving clear directions about how each subtask should be carried out and assigning every group member a particular role to serve in the group. As the year progresses and students become more adept at working cooperatively, we can gradually become less directive about how small-group tasks are accomplished.
- *Effective teachers capitalize on technological innovations to enhance students' learning and performance.* Interactive smartboards, learning management systems, basic software (e.g., word processing programs, spreadsheets), topic-specific instructional software, websites, and various apps—all of these innovations can potentially help students better understand and apply classroom subject matter. Yet, as is true for more traditional "low-tech" instructional methods, such innovations can be effective only to the extent that they facilitate productive cognitive processes, foster continuing motivation, and provide sufficient scaffolding to foster students' success. Furthermore, they tend to have a greater impact when they're used in conjunction with—rather than as replacements for—more traditional methods involving face-to-face teacher–student interaction (Azevedo & Witherspoon, 2009; Kirschner & van Merriënboer, 2013; Tamin et al., 2011).
- *Effective teachers take student diversity into account when planning and carrying out instruction.* Our choice of instructional strategies must, of course, be appropriate for students' current ability levels and existing knowledge related to the topics and skills at hand. We must take temperamental and motivational characteristics into consideration as well. When teachers feel confident in their ability to teach specific content in ways that meet individual students' unique needs, students will be able to learn more effectively, and also may increase their interest in the content (e.g., in math or language arts) (ten Hagen et al., 2022). For example, some children and adolescents have trouble sitting still and concentrating during lengthy lectures, and many students find hands-on activities more engaging than abstract textbook readings. Students with special educational needs often require accommodations tailored to their unique abilities and disabilities. Ideally, instruction is individually tailored for *all* students—a practice called **differentiated instruction**.
- *Effective teachers understand that students learn most effectively when they are not distracted.* Students often try to do many things at the same time—for example, watching a movie while reading a chapter.
- *Effective teachers regularly assess and provide feedback about students' progress.* Assessment isn't something we do only at the end of instruction. It's also something we must do *throughout* instruction—a process known as **formative assessment**. Regularly determining students' ongoing understanding and skill—what they understand and misunderstand, what they can and cannot do—enables us to modify our instructional strategies in ways that maximize learning. It also enables us to provide

the constructive feedback students may need to capitalize on their strengths, work on their weak spots, increase their self-efficacy, and, in general, be optimistic that they can ultimately achieve at high levels (Hattie & Gan, 2011; Narciss, 2008).

Planning for Instruction

Learning Objective 13.2 Describe important elements of instructional planning, and explain how and why planning and instruction must be closely intertwined.

Good teachers engage in considerable advance planning: They identify the information and skills they want students to acquire, consider the prior knowledge and life experiences of their students, determine an appropriate sequence in which to teach, and develop lessons and activities that will maximize learning and keep students motivated and on task. Ideally, teachers also coordinate their plans with colleagues—for example, identifying common goals toward which everyone will strive, developing interdisciplinary units that involve two or more subject areas, and preparing students for content that they will subsequently learn as they move into higher grades. Effective teachers regularly share their plans and goals with their students. Especially when used in combination, such strategies can make a *big* difference in students' long-term learning and development (e.g., Hattie, 2009; Konstantopoulos & Chung, 2011; Pianta et al., 2009; Wagner et al., 2016).

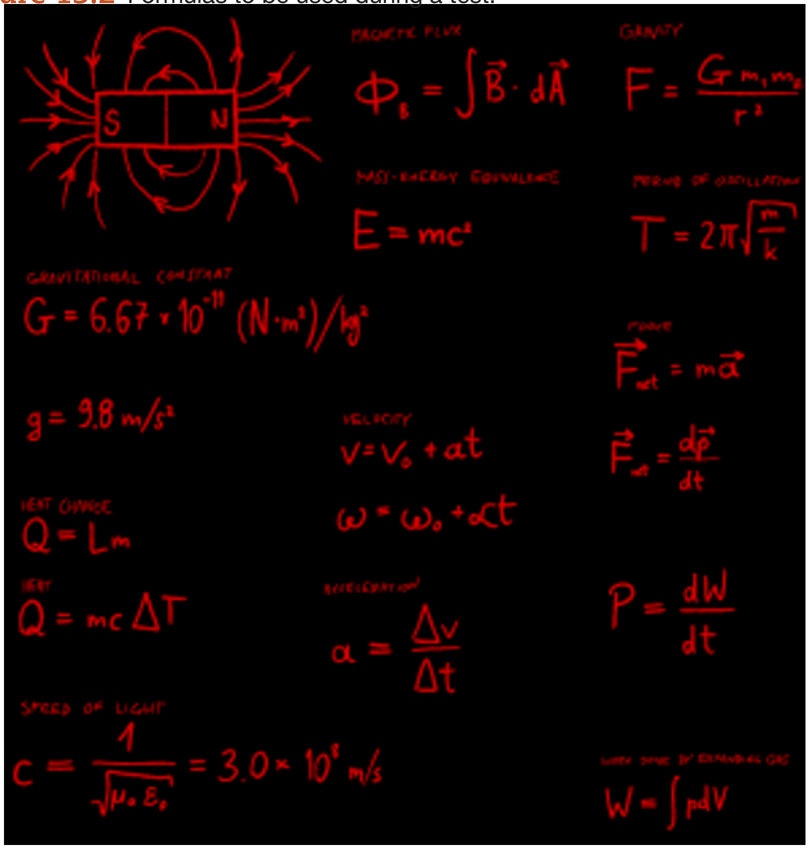
Identifying the Goals of Instruction

An essential step in planning is to identify the specific things students should accomplish during a lesson or unit, as well as what they should accomplish over the course of a semester or school year. Educators use a variety of terms for such end results, including *goals, objectives, outcomes, competencies, benchmarks,* and *standards.* For example, each chapter in this book begins with *learning objectives* that have guided our writing and can help readers anticipate and organize the chapter's topics. In our discussion here, however, we'll typically use the term **instructional goals** when referring to desired general, long-term outcomes of instruction. We'll use the term **instructional objectives** when referring to more specific outcomes of a particular lesson or unit.

Consistent with the concept of *backward design,* identifying instructional goals and objectives should be the very first step in the instructional planning process. Our instructional strategies *must* be dictated by our short- and long-term goals for students' learning. It is also helpful for students to know these goals and objectives. When they know what we hope they'll accomplish, they can make more informed decisions about how to focus their efforts and allocate their study time, and they can more effectively monitor their comprehension and use appropriate strategies (Gronlund & Brookhart, 2009). For example, if we ask students to apply math concepts and procedures to practical, real-world situations, they'll probably think about and study math quite differently than if we tell them—or in some way imply—that they should rote-memorize definitions and formulas (a learning strategy that we authors certainly don't recommend!). Students often benefit from being given a sheet with formulas to use during tests; that way they can focus their attention on when and how to use the formulas, and not on memorizing them. An example of such a sheet is presented in Figure 13.2.

Aligning Instructional Goals with National, International, and State Standards People have varying opinions about what students should learn in elementary and secondary school. Some factual knowledge is essential for students' long-term academic and professional success. But equally essential are the complex cognitive processes (e.g., problem solving, critical thinking), general *habits of mind* (e.g., scientific reasoning, drawing inferences from historical documents) and "21st Century Skills" (e.g., adaptability, complex communication skills, and ability to solve non-routine problems) that

Figure 13.2 Formulas to be used during a test.


S
N
MAGNETIC FLUX
$\Phi_B = \int \vec{B} \cdot d\vec{A}$
GRAVITY
$F = \frac{G m_1 m_2}{r^2}$
MASS-ENERGY EQUIVALENCE
$E = mc^2$
PERIOD OF OSCILLATION
$T = 2\pi\sqrt{\frac{m}{k}}$
GRAVITATIONAL CONSTANT
$G = 6.67 \times 10^{-11} (N \cdot m^2)/kg^2$
FORCE
$\vec{F}_{net} = m\vec{a}$
$g = 9.8 m/s^2$
VELOCITY
$v = v_0 + at$
$\vec{F}_{net} = \frac{d\vec{p}}{dt}$
$\omega = \omega_0 + \alpha t$
HEAT CHANGE
$Q = Lm$
HEAT
$Q = mc\Delta T$
ACCELERATION
$a = \frac{\Delta v}{\Delta t}$
$P = \frac{dW}{dt}$
SPEED OF LIGHT
$c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}} = 3.0 \times 10^8 m/s$
WORK DONE BY EXPANDING GAS
$W = \int p\,dV$

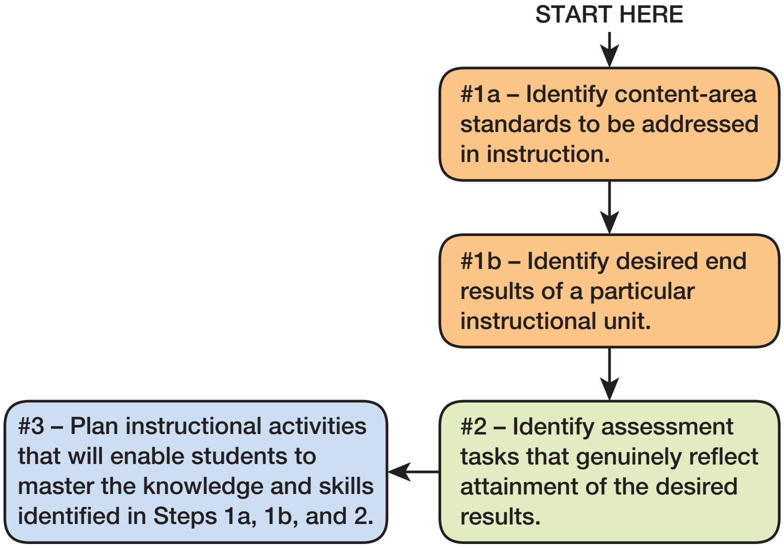
Tupungato/Shutterstock

are central to various academic disciplines (Brophy et al., 2009; Linn, 2008; Monte-Sano, 2008; National Research Council, 2010; Sawyer, 2006).

One important source of guidance comes from **content-area standards** identified by national and international discipline-specific professional groups (e.g., National Council for Geographic Education, National Association for Music Education). Such standards are typically in the form of general statements regarding the knowledge and skills that students should acquire at various grade levels, as well as the characteristics that their accomplishments should reflect.

Also, in the United States, state departments of education—as well as some local school districts—have established comprehensive lists of standards in reading, writing, math, science, and social studies, and sometimes in art, music, foreign languages, health, and physical education. Teachers are expected to help students make significant progress toward these standards.

Figure 13.3 Adding content-area standards to a backward design.


START HERE
#1a – Identify content-area standards to be addressed in instruction.
#1b – Identify desired end results of a particular instructional unit.
#2 – Identify assessment tasks that genuinely reflect attainment of the desired results.
#3 – Plan instructional activities that will enable students to master the knowledge and skills identified in Steps 1a, 1b, and 2.

With the importance of considering content-area standards in mind, let's break the first step of a backward design into two sub-steps, as shown in Figure 13.3. In particular, we explicitly identify one or more standards we want our students to meet (Step 1a) and then pin down more specific outcomes we want an instructional unit to address (Step 1b). Only after we've done *both* of these things do we identify appropriate assessment tasks (Step 2) and, finally, plan our instructional strategies that will enable students to master the knowledge and feel confident in their own abilities to meet the desired results (Step 3).

We should keep in mind that existing content-area standards focus almost exclusively on what students should achieve in reading, writing, and various academic content domains. They largely overlook goals that lie *outside* particular content areas—for instance, goals related to technological literacy, effective study strategies, self-regulation techniques, creativity, and socioemotional skills. The International Society for Technology in Education (ISTE) has developed standards that can help us enhance students' knowledge and skills related to digital technologies (go to www.iste.org/standards). But with an eye toward enhancing students' long-term academic social success both at school and in the outside world, we must also develop some of our *own* goals for students during their time in our classrooms.

Writing Useful Goals and Objectives Our goals and objectives are useful only to the extent that they provide concrete guidance as we plan instructional activities and assessment procedures. The Into the Classroom feature "Identifying Appropriate Goals and Objectives" offers suggestions for writing useful ones.

An especially important suggestion in the Into the Classroom feature is to *include goals and objectives with varying levels of complexity and sophistication.* One tool that can help us keep a broad view of what students should learn and be able to do is a 2001 revision of **Bloom's taxonomy**, a list of six general cognitive processes that vary in complexity:

1. *Remember:* Recognizing or recalling information learned at an earlier time and stored in long-term memory
2. *Understand:* Constructing meaning from instructional materials and messages (e.g., drawing inferences, identifying new examples, summarizing)
3. *Apply:* Using knowledge in a familiar or new situation
4. *Analyze:* Breaking information into its constituent parts and perhaps also identifying interrelationships among the parts
5. *Evaluate:* Making judgments about information using certain criteria or standards
6. *Create:* Putting together knowledge, procedures, or both to form a coherent, structured, and possibly original whole (Anderson & Krathwohl, 2001)[2]

Another helpful taxonomy can be found in *Understanding by Design* (e.g., Wiggins & McTighe, 2005, 2011; McTighe, Wiggins, & ASCD, 2012), a resource for guiding teachers through the backward-design process. This taxonomy identifies six forms ("facets") that students' understanding of a topic might take:

1. *Explanation:* Integrating various bits of information into meaningful wholes (e.g., knowing the *hows* and *whys* of various facts and principles), drawing appropriate inferences, and possibly helping others understand the subject matter
2. *Interpretation:* Making sense of and identifying the underlying meanings of events, data, documents, and works of art and literature
3. *Application and adjustment:* Using acquired knowledge in new situations and diverse contexts
4. *Perspective:* Considering various points of view regarding an issue; trying to minimize bias in one's own analysis of the issue
5. *Empathy:* Looking at a situation or issue from a particular individual's or group's vantage point, perhaps based on the individual's or group's feelings or general worldviews
6. *Self-knowledge:* Identifying gaps in one's own understandings, as well as personal prejudices that might distort one's views and interpretations

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[2] Bloom's original taxonomy uses nouns rather than verbs: *knowledge, comprehension, application, analysis, synthesis, evaluation.* In the revision shown here, *create* replaces and subsumes *synthesis*, and *evaluate* moves from sixth to fifth place.

Into the Classroom

Identifying Appropriate Goals and Objectives

- **Consult state, national, and international standards, but don't rely on them exclusively.**

  In identifying instructional goals for the year, a middle school science teacher takes into account the Next Generation Science Standards (www.nextgenscience.org), which her state has adopted as a framework for guiding schools' science curricula. In addition, she identifies specific objectives related to two issues directly affecting many students in her inner-city school district: poor nutrition and air pollution.

- **Be realistic about what can be accomplished in a given time frame; allow time to pursue important topics in depth.**

  Rather than expect students to remember a lot of discrete facts in social studies, a second-grade teacher identifies several "big ideas" students should master during the year—for instance, the ideas that (a) all people have certain needs and desires that affect their behaviors and (b) different cultural groups may strive to satisfy those needs and desires in different ways.

- **Identify both short-term objectives and long-term goals.**

  A tenth-grade French teacher wants students to learn at least 20 new vocabulary words each week. He also wants them to write coherent and grammatically correct paragraphs by the end of the year.

- **In addition to goals related to specific topics and content areas, identify goals related to students' general long-term academic success.**

  A middle school teacher knows that early adolescence is an important time for developing the learning and study strategies that students will need in high school and college. Throughout the school year, he continually introduces and practices new strategies for learning and remembering content—for example, effective ways to organize notes, and mnemonic techniques for remembering important facts—and regularly assesses students' progress in using these strategies.

- **Include goals and objectives with varying levels of complexity and sophistication.**

  A high school physics teacher wants students not only to understand various kinds of simple machines (e.g., levers, wedges) but also to recognize examples in their own lives (e.g., crowbars, spatulas) and to use these machines to solve real-world problems.

- **Consider physical, social, motivational, and affective outcomes as well as cognitive outcomes.**

  A physical education teacher wants her students to know the basic rules of basketball and to dribble and pass the ball appropriately. She also wants them to acquire a love of basketball, effective ways of working cooperatively with teammates, and a general desire to stay physically fit.

- **Describe goals and objectives not in terms of what the teacher will do during a lesson but in terms of what *students* should be able to do at the *end* of instruction—and, ideally, also in ways that point to appropriate assessment tasks.**

  A Spanish teacher knows that students often confuse the verbs *estar* and *ser* because both are translated into English as "to be." She identifies this objective for her students: "Students will correctly conjugate *estar* and *ser* in the present tense and use each one in appropriate contexts." She assesses students' ability to use the two verbs correctly through both paper–pencil quizzes and in-class conversations.

- **When writing short-term objectives, identify specific behaviors that will reflect accomplishment of the objectives.**

  In a unit on the food pyramid, a health teacher identifies this objective for students: "Students will create menus for a breakfast, lunch, and dinner that, in combination, include all elements of the pyramid in appropriate proportions."

- **When writing long-term goals that involve complex topics or skills, list a few outcomes and give examples of specific behaviors that reflect each one.**

  Teachers at a middle school identify this instructional goal for all students at their school: "Students will demonstrate effective listening skills, for example, by taking thorough and accurate notes, responding correctly to questions, and seeking clarification when they don't understand."

- **Provide opportunities for students to identify goals and objectives of their own.**

  A high school art teacher asks students to choose from a list of different media one they'd each like to focus on during the semester (e.g., pastels, oils, clay) and to identify at least three skills they want to improve while working with the chosen medium. He helps students develop concrete goals toward which they'll work and specific criteria they can use to evaluate their progress.

SOURCES: Brophy, 2008; Brophy et al., 2009; Cole, 1990; Gronlund & Brookhart, 2009; Miller et al., 2009; Pellegrino et al., 2001; Popham, 2014; Wiggins & McTighe, 2011.

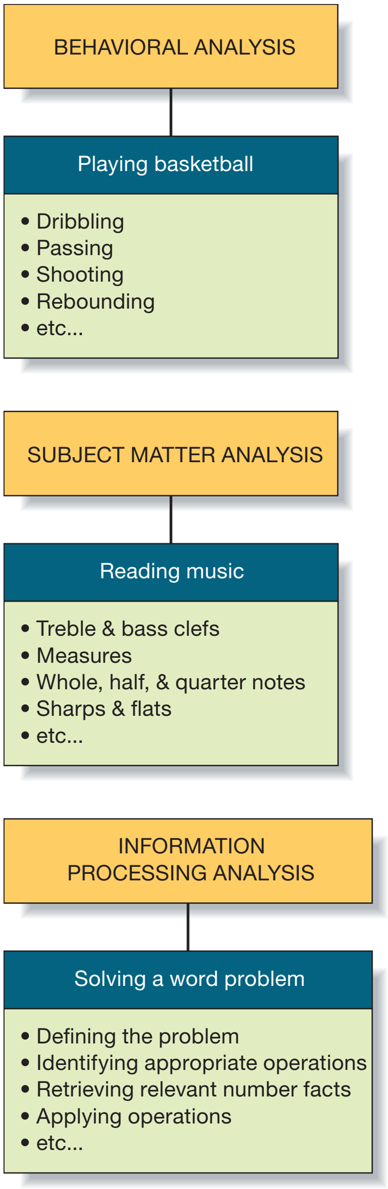
Neither of the preceding taxonomies provides exhaustive lists of what students should be able to do while learning; for example, they don't include psychomotor skills. Nor do the particular sequences of items necessarily reflect a progression from simpler to more complex processes (Anderson & Krathwohl, 2001; Iran-Nejad & Stewart, 2010; Marzano & Kendall, 2007). Even so, the taxonomies can certainly remind us that there's much more to learning and achievement than remembering discrete facts. More detailed, comprehensive taxonomies—which are too complex to present here—can provide additional guidance (e.g., see Marzano & Kendall, 2007).

Conducting a Task Analysis

In addition to identifying goals and objectives for instruction, we need to determine how best to break down complex topics and skills into manageable chunks. As examples, consider these four teachers:

- Ms. Begay, a third-grade teacher, wants to help her students learn more effectively from reading materials.
- Mr. Marino, a high school physical education teacher, wants his students to develop enough proficiency in basketball to feel comfortable playing either on organized basketball teams or in pick-up games in their neighborhoods.
- Mr. Wu, a junior high school music teacher, hopes to teach his new trombone students how to play "Jingle Bell Rock" in time for the New Year's Day parade.
- Ms. Flores, a high school social studies teacher, is going to introduce her students to the intricacies of the federal judicial system.

Figure 13.4 Three approaches to task analysis.


BEHAVIORAL ANALYSIS
Playing basketball
• Dribbling
• Passing
• Shooting
• Rebounding
• etc...
SUBJECT MATTER ANALYSIS
Reading music
• Treble & bass clefs
• Measures
• Whole, half, & quarter notes
• Sharps & flats
• etc...
INFORMATION PROCESSING ANALYSIS
Solving a word problem
• Defining the problem
• Identifying appropriate operations
• Retrieving relevant number facts
• Applying operations
• etc...

All four teachers want to teach complex topics or skills. Each of them could conduct a **task analysis**, identifying the essential behavioral or cognitive aspects of mastering a particular topic or skill. The task analyses can then guide the teachers in their selections of appropriate methods and sequences in which to teach the subject matter.

Figure 13.4 illustrates three general approaches to task analysis (Jonassen et al., 1989; also see R. E. Clark et al., 2008):

- *Behavioral analysis.* One way of analyzing a complex task is to identify the specific behaviors required to perform it (much as a behaviorist might do). For example, Mr. Marino can identify the specific physical movements involved in dribbling, passing, and shooting a basketball.
- *Subject matter analysis.* Another approach is to break down the subject matter into the specific topics, concepts, and principles that it includes. For example, Ms. Flores can identify various aspects of the judicial system (concepts such as *innocent until proven guilty* and *reasonable doubt*, the roles that judges and juries play, etc.) and their interrelationships. Mr. Wu can identify the basic elements of written music that his trombone students must be able to interpret, such as the bass clef and whole, half, and quarter notes. Subject matter analysis is especially important when the subject matter being taught includes many interrelated concepts and ideas that students should learn meaningfully and with conceptual understanding.
- *Information processing analysis.* A third approach is to specify the cognitive processes involved in a task. As an illustration, Ms. Begay can identify specific metacognitive strategies useful in reading comprehension, such as finding main ideas, elaborating, and self-questioning.

To get a taste of what a task analysis might involve, try the next exercise.

Experiencing Firsthand

Peanut Butter Sandwich

Conduct a task analysis for the process of making a peanut butter sandwich, as follows:

1. Decide whether your approach should be a behavioral analysis, a subject matter analysis, or an information processing analysis.
2. Using the approach you've selected, break the sandwich-making task into a number of small, teachable steps.
3. (Optional) If you're hungry and have the necessary materials close at hand, make an actual sandwich following the steps you've identified. Did your initial analysis omit any important steps?

Chances are good that you chose a behavioral analysis, because making a peanut butter sandwich is largely a behavioral rather than a mental task. For example, you must know how to unscrew the lid of a peanut butter jar, get an appropriate amount of peanut butter on your knife, and spread the peanut butter gently enough that you don't tear the bread.

Conducting task analyses for complex skills and topics serves at least four important functions in instructional planning (Jonassen et al., 1989; Mayer, 2011; Stokes et al., 2010a; van Merriënboer & Kester, 2008). First, when we identify a task's specific components—whether behaviors, concepts and ideas, or cognitive processes—we gain a better sense of what things students need to learn and the order in which to most effectively learn them. Second, a task analysis helps us choose appropriate instructional strategies. For example, if one necessary component of solving math word problems is rapid retrieval of math facts from long-term memory, repeated practice of the facts may be critical for developing automaticity. If another aspect of solving such problems is identifying the relevant operation(s) to apply (addition, subtraction, etc.), we must promote a deep understanding of math concepts and principles, perhaps by using concrete manipulatives or authentic activities.

A third function of a task analysis is determining what kind of *cognitive load* a new task might impose on students—in particular, whether certain aspects of a task might initially put a strain on students' limited working memory capacity. Sometimes the analysis will reveal that certain components of a task should be taught separately, one at a time. For instance, Mr. Wu may initially ask his beginning trombone students to practice blowing into the mouthpiece correctly without worrying about the specific notes they produce. But on other occasions it might be both possible and desirable to teach the necessary knowledge and behaviors entirely within the context of the overall task, in part because doing so makes the subject matter meaningful for students. For instance, Ms. Begay should almost certainly teach her students effective metacognitive processes in reading primarily within the context of authentic reading activities.

A fourth function of task analysis that is often not considered is student motivation. Some tasks (e.g., learning how to play "Jingle Bell Rock" on the trombone) may be intrinsically motivating and highly valued by students; however, other tasks (e.g., learning about the intricacies of the federal judicial system) may be of little interest to your students. We need to consider student motivation as we introduce tasks to our students. When Mrs. Flores prepares her lesson about the judicial system, she might consider how to help her students to value the lesson more, perhaps by considering ways of making some of the information that the students need to understand (e.g., "innocent until proven guilty") meaningful to the students by relating the information to current events or to the plot of a movie or TV show.

Developing a Lesson Plan

After identifying specific goals for instruction—in part by taking into account any mandated or recommended content-area standards—and perhaps also conducting one or more task analyses, effective teachers develop one or more **lesson plans** to guide them during instruction. A lesson plan typically includes the following:

- The goal(s) or objective(s) of the lesson and, if applicable, relevant content-area standard(s)
- Instructional materials (e.g., textbooks, handouts, software) and equipment required
- Specific instructional strategies and the sequence in which they'll be used
- Assessment method(s)

Any lesson plan should also take into account the particular students who will be learning—their developmental levels, prior knowledge, cultural backgrounds, and (if applicable) special educational needs.

As a beginning teacher, you'll initially need to develop fairly detailed lesson plans that describe how you're going to help your students learn the subject matter in question (Calderhead, 1996; Corno, 2008; Sternberg & Horvath, 1995). For instance, when we authors first began teaching, we spent many hours each week writing down the information, examples, questions, and activities we wanted to use in class during the following week. But as you gain experience teaching certain topics, you'll learn which strategies work effectively and which do not, and you may use some of the effective ones frequently enough that you can retrieve them quickly and easily from long-term memory. Consequently, as time goes on, you'll find that planning lessons becomes far less time consuming, and much of it becomes *mental* planning rather than planning on paper or a computer screen.

In planning lessons, teachers have many resources at their disposal, including experienced teachers' lesson plans in books, on the internet, and those that are shared by colleagues. For example, the following websites offer lesson plans and related materials concerning a wide range of topics:

- Smithsonian Institution (www.smithsonianeducation.org)
- Educator's Reference Desk (www.eduref.org)
- Discovery Education (www.discoveryeducation.com)
- Scholastic (https://teachables.scholastic.com/teachables/premium/free-lesson-plans.html)

In your first few months of teaching, create fairly detailed lesson plans to guide you, but be flexible when circumstances call for adjustments.

In taking advantage of such resources, however, we must always keep in mind that *lessons should be closely tied to instructional goals and objectives for your students.* Lesson plans can and should be adjusted as events unfold. For example, during a lesson, we may find that we need to back up and teach material we'd mistakenly assumed students had already mastered (many teachers faced this dilemma repeatedly as a result of the Covid-19 pandemic's effects on learning and instruction). If students express considerable curiosity or have intriguing insights about a particular topic, we might want to capitalize on this unique opportunity—this **teachable moment**—and spend more time exploring the topic than originally planned. And if students seem bored with a lesson, we might want to consider ways to make the content more relevant or intriguing for them.

As we proceed through the year, our long-range plans may also change to some degree. For instance, we may find that our initial task analyses of certain topics are overly simplistic, or we may discover that our initial expectations for students' achievement are either unrealistically high or unnecessarily low. Both short-term and long-term lesson planning, then, must continue to be a work in progress.

Using Technology to Share Goals and Facilitate Communication throughout the School Year

When creating online resources to communicate with families, keep in mind that not all families have easy access to technology.

Historically, a traditional practice at the high school and college levels has been to give students a printed syllabus that lists course topics, instructional goals, homework assignments, due dates, and scheduled assessments. But increasingly teachers at all levels are sharing such information—and much more—through learning management systems or class-specific websites. In addition, when the Covid-19 pandemic emerged, teachers and students had to learn, quickly, how to use technology to communicate with each other.

Learning management systems such as Google Classroom, Schoology, Canvas, and others, provide easy ways for us to communicate regularly with students and their parents. They can't be the *only* way, however. Not all students and parents have easy access to computers and the internet at home. And some individuals—parents especially—may not have the technological literacy they need to access and navigate through a website. Accordingly, we should also provide hard copies of both assignments we want students to do as homework and information we want parents to know.

Teacher-Directed Instructional Strategies

Learning Objective 13.3 Explain how you can effectively promote students' learning through teacher-directed instructional strategies.

Teacher-directed instruction can include a variety of strategies. Much of it involves **expository instruction**, in which information is presented (i.e., *exposed*) in essentially the same form in which students are expected to learn it. Some elements of Mr. Quinn's lesson in the opening case study—notably the facts he presents and the things he displays on the screen—are expository in nature.

Yet as we'll see in upcoming sections, teachers can direct students' learning in other ways as well—for instance, by asking questions that get students thinking in particular ways or by assigning tasks that require students to practice and apply new skills.

Presenting New Material through Traditional Expository Methods: Lectures and Textbooks

"Your lectures cured my sleep disorder."

Cartoonresource/Shutterstock

Some researchers have criticized lectures and textbooks for putting students in a physically passive role (e.g., Skinner, 1968). But cognitive psychologists argue that students are often *mentally* active during such seemingly passive activities as listening and reading (Ausubel et al., 1978; Mayer, 2011; Weinert & Helmke, 1995). The degree to which students learn from expository instruction depends on their cognitive engagement (for example, the extent to which they pay attention) and their ability to use appropriate self-regulatory and metacognitive strategies (for example, to focus on meaningful rather than rote learning, and to monitor their comprehension).

Unfortunately, lectures and textbooks don't always present information in ways that promote learning. For example, you can probably think of high school or college instructors whose lectures were dry, disorganized, confusing, or in some other way unmotivating and noninformative. Analyses of school textbooks in such diverse disciplines as history, geography, and science have found the focus of many texts to be on teaching specific facts, with little attention to helping students learn the facts in a meaningful way (Beck & McKeown, 1994, 2001; Brophy et al., 2009; Linn & Eylon, 2011). However, many textbooks are now available in digital formats, allowing for greater versatility and interactivity (see Figure 13.5).

Expository instruction has a distinct advantage: It enables us to present information quickly and efficiently. By itself, however, it doesn't allow us to assess students' progress in learning the subject matter. Whenever possible, then, we should use it in combination with other instructional strategies—perhaps asking questions and having students apply what they're studying in both class and homework assignments. The Into the Classroom feature "Effectively Using Expository Instruction" suggests several research-based strategies for promoting productive cognitive processes through explanations, lectures, and other expository approaches.

Figure 13.5 Many textbooks are now available online and can be accessed via computers, tablets, or even smartphones.

Into the Classroom

Effectively Using Expository Instruction

- **Use an advance organizer—a verbal or graphic introduction that lays out the general organizational framework of upcoming material—to help students make meaningful connections among the things they learn.**

  A high school math teacher introduces a unit on descriptive statistics by saying, "Descriptive statistics are ways of describing and categorizing information, using numbers. We'll first talk about some descriptive statistics that you are already familiar with, like frequency counts and means; then we'll move into some lesser known statistics, such as the median, the range, and the mode. Finally, we'll talk about a new statistic—the standard deviation—and we'll compare and contrast the different types of information that means and standard deviations provide."

- **Make ongoing connections between new information and things students already know, perhaps by drawing analogies between abstract ideas and students' everyday experiences.**

  A middle school geography teacher draws an analogy between how a glacier grows and how pancake batter behaves as it's poured into a frying pan: "As more and more substance is added to the middle, the edges spread farther and farther out."

- **Informally assess students' existing understandings of the topic to determine whether they have misconceptions that require conceptual change.**

  When beginning a unit on the solar system, a fourth-grade teacher asks her students, "What do we mean when we say that the sun *sets*? Does the sun really go *down* at the end of the day?" Several students respond that the sun does indeed go down and then travels to the other side of the world. The teacher isn't surprised—their misconception is a common one—but she uses models of planets to demonstrate to students that the Earth's rotation gives the appearance of the sun moving around it, when actually the opposite is true.

- **Present new ideas in a logical, organized manner that enables students to make appropriate interconnections.**

  While describing the contributions of various vitamins and minerals to people's health, a ninth-grade health teacher creates a chart showing a two-column table that lists each nutrient and its benefits.

- **Consider student motivation by fostering positive achievement values.**

  During a unit on trigonometry, a high school math teacher invites a friend who is a civil engineer to meet with the class via Zoom, to talk about how she uses trigonometry in her work all the time.

- **Give numerous signals about the information that is most important for students to learn and remember.**

  When beginning a unit about the U.S. government, a high school government teacher writes the phrase "Checks and Balances" on the board and underlines it with big, bold strokes. "This is a key principle that guided delegates to the Constitutional Convention as they wrote the Constitution. We're going to look at how each of the three branches of government—executive, legislative, and judicial—places limits on the power of the other two branches. Be sure to include at least four examples of checks and balances in your class notes for today."

- **Use visual aids to help students encode material visually as well as verbally.**

  In a lesson on western expansion in North America in the 1800s, a sixth-grade teacher shows digitized photos of typical covered wagons and wagon trains to help students get a sense of how arduous the westward migration might have been for pioneer families.

- **Consider your students' prior knowledge when lecturing—sometimes less is more.**

  A fourth-grade teacher is lecturing in great detail about the history of the neighborhood where her students live. When she sees that her students seem to be getting bored, she reassesses her lesson for the next day and decides to shorten her lectures.

- **Pace your presentation slowly enough to give students adequate time to think about and meaningfully process the information.**

  To demonstrate how to make a pinch pot from a ball of clay, an elementary school art teacher proceeds through the steps slowly and deliberately, explaining what he's doing every step of the way: "First I roll the clay into a nice round ball—as round as I can make it, with no cracks or rough edges. . . . Okay, see how I've done that? Now I hold the ball in both hands and gently push my thumbs into the middle, slowly pushing them farther and farther in, but being sure that I don't push them out the other side of the ball. . . . And then I gradually push the sides of the ball outward, continually turning the ball so that I make the sides of my pot an even thickness all the way around."

- **At the end of a lecture or reading assignment, summarize key points as a way of helping students organize the material and identify its main ideas.**

  A high school English teacher sums up a lesson on the poems of Emily Dickinson by describing the characteristics that make Dickinson's poetry so unique and powerful.

SOURCES: Bulgren et al., 2000; Carney & Levin, 2002; Clement, 2008; Corkill, 1992; Dansereau, 1995; Edmonds et al., 2009; Ferguson & Hegarty, 1995; Gweon et al., 2018; Ku et al., 2008; Levin & Mayer, 1993; Linn & Eylon, 2011; Lorch et al., 1993; Mayer, 2010; Mayer & Gallini, 1990; M. A. Moreno, 2006; Newby et al., 1994; Pittman & Beth-Halachmy, 1997; Reynolds & Shirey, 1988; Sadoski & Paivio, 2001; Scevak et al., 1993; Small et al., 1993; Verdi & Kulhavy, 2002; Wade, 1992; Winn, 1991; Wittwer & Renkl, 2008; Zook, 1991.

Asking Questions and Giving Feedback

Some teachers use **lower-level questions** that ask students to retrieve information from long-term memory. Such questions have several benefits:

- They give us a good idea of students' current understandings and misconceptions about a topic.
- They help keep students' attention on the lesson in progress, especially when they require all students to respond to each question in some way.
- They help us assess whether students are learning material successfully or, instead, are confused about particular points.
- They give students the opportunity to monitor their *own* comprehension—to determine whether they understand the information being presented or, instead, should ask for help or clarification.
- When students are asked questions about material they have studied at an earlier time, they must review that material, which should promote greater recall later on. (Airasian, 1994; Brophy, 2006; Connolly & Eisenberg, 1990; Fox & LeCount, 1991; Wixson, 1984)

Ask lower-level questions to check for basic understanding and recall.

Following is an example of how one eighth-grade teacher promoted review of a lesson on ancient Egypt by asking questions:

Teacher: The Egyptians believed the body had to be preserved. What did they do to preserve the body in the earliest times?

Student: They dried them and stuffed them.

Teacher: I am talking about from the earliest times. What did they do? Carey.

Carey: They buried them in the hot sands.

Teacher: Right. They buried them in the hot sands. The sand was very dry, and the body was naturally preserved for many years. It would deteriorate more slowly, at least compared with here. What did they do later on after this time?

Student: They started taking out the vital organs.

Teacher: Right. What did they call the vital organs then?

Norm: Everything but the heart and brain.

Teacher: Right, the organs in the visceral cavity. The intestines, liver, and so on, which were the easiest parts to get at.

Teacher: Question?

Student: How far away from the Nile River was the burial of most kings? (Aulls, 1998, p. 62)

At the end of the dialogue, a *student* asks a question, one that requests additional information. The student is apparently trying to elaborate on the material, perhaps speculating that only land a fair distance from the Nile would be dry enough to preserve bodies for a lengthy period. We can encourage such elaboration, as well as more complex cognitive processes, by asking **higher-level questions**—those that in some way require students to expand on the information they've learned (Brophy, 2006; Jensen et al., 2014; Minstrell & Stimpson, 1996; Redfield & Rousseau, 1981). For instance, a higher-level question might ask students to think of their own examples of a concept, use a newly learned principle to solve a problem, or speculate about possible explanations for a cause-and-effect relationship.

Ask higher-level questions to encourage elaboration and complex cognitive processes such as problem solving and critical thinking.

As another example, when a science class is studying the nature of air pressure at different altitudes, a teacher might ask questions about the following scenario in Rocky Mountain National Park, which has altitudes ranging from 1½ to more than 2 miles above sea level:

> A group of Girl Scouts went hiking in Rocky Mountain National Park. They noticed that it was harder to breathe when hiking in the mountains than when hiking in [hometown]. During the hike, one girl opened a tube of suntan lotion that she bought in [hometown]. When she opened it, a small squirt of air and lotion shot out.
>
> - Why did the girls have a hard time breathing?
> - Why did the air and lotion squirt out of the tube? (Pugh et al., 2010, p. 9)

Have all students either manually or electronically "vote" on various answers to questions.

Often we can simultaneously pose questions to *all* of our students. For example, we might ask a multiple-choice question and have students "vote" on various answers by raising their hands, holding up premade response cards, or using software (e.g., kahoot.com) that allows students to anonymously vote using their tablets, phones, or computers (Glass & Sinha, 2013; Lambert et al., 2006; Munro & Stephenson, 2009). However, we must give students adequate time to think about our questions and retrieve information relevant to their answers. We must remember, too, that students from some cultural and ethnic backgrounds may intentionally allow several seconds to elapse before responding as a way of being courteous and showing respect for the speaker (Castagno & Brayboy, 2008; Rowe, 1987; Tharp, 1989).

The importance of such *wait time* is discussed in more detail in Chapter 4 and Chapter 7.

Unless we specifically want to have students deliberate about particular issues over a lengthy period, we should give them feedback about their responses to our questions. Furthermore, we must help students save face when an initial response is incorrect, perhaps by gently nudging them toward a better one. For example, in an elementary school lesson on food groups, a student incorrectly answered that orange juice was a member of the "milk" group, and his teacher nudged him in the right direction with these hints:

Chapter 14 offers additional strategies for giving feedback.

> Everything in the milk group comes from a cow. What does orange juice come from? . . . Orange juice comes from oranges. If it comes from oranges, which group is oranges? . . . Is it fruit or bread? (Brophy et al., 2009, p. 225)

Providing Practice through In-Class Assignments

When we choose or create assignments for students, our number-one criterion must be to help students accomplish instructional goals. Some goals may be at the *remember* or *understand* level in Bloom's taxonomy—for example, correctly conjugating

Prioritize assignments based on their relevance to important instructional goals.

the French verb *être* ("to be") or showing knowledge of current events in one's community. Other goals will be higher-level ones—for example, writing a well-organized persuasive essay or being able to explain why gravity works differently on other planets.

Especially when higher-level goals are involved, we should assign tasks that help students learn classroom material in a meaningful, integrated manner. Often we'll want to assign authentic activities, perhaps within the context of small cooperative groups in which students can share ideas, ask one another questions, and offer explanations of their thinking. Because authentic activities are typically less structured and more complex than traditional classroom tasks, they're apt to require a good deal of teacher scaffolding (Hmelo Silver, 2006; Mergendoller et al., 2006; van Merriënboer et al., 2003).

It usually isn't a good idea to fill the entire curriculum with authentic tasks, however. For one thing, students can often master basic skills more effectively when they practice them in relative isolation from more complex activities (Anderson et al., 1996). For example, when learning to play the violin, students need to master their fingering before they join an orchestra. In addition, some authentic tasks are too expensive and time consuming to warrant regular use in the classroom (Bereiter & Scardamalia, 2006; Griffin & Griffin, 1994). It's probably most important that assignments encourage effective cognitive processing (e.g., organization, elaboration) and that students understand the relevance of what they're learning for larger tasks they'll face down the road (Anderson et al., 1996; Bransford et al., 2006).

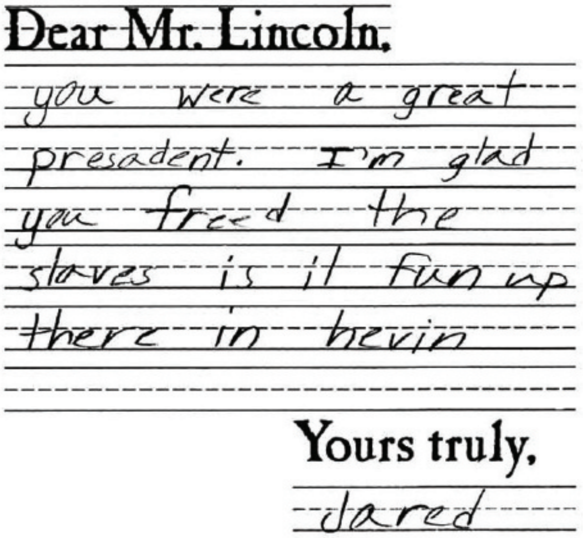
Regardless of whether assignments are authentic or more traditional, we're most likely to facilitate students' learning and achievement when we:

Tasks that challenge students to "stretch" their existing abilities can promote their cognitive development; see Vygotsky's concept of *zone of proximal development* in Chapter 2.

- Clearly define each task and its purpose—students should have an understanding about why they are being asked to engage in a task.
- Stimulate interest and cognitive engagement in the task (see Figure 13.6, in which a second-grade teacher asks students to write a brief note to President Lincoln, after having completed a history unit).
- Begin at an appropriate difficulty level, ideally by assigning tasks that challenge students to "stretch" their existing knowledge and skills; accommodate diversity in students' abilities and needs. (Vygotsky's concept of *zone of proximal development* is helpful here.)
- Increase difficulty and complexity—or gradually decrease scaffolding—as students gain proficiency.
- Frequently monitor students' progress and give meaningful feedback that promotes further growth.
- Assess students' work in ways that reward high quality but also allow for experimentation and risk taking.
- Encourage students to reflect on and evaluate their own work.

(Brophy et al., 2009; Doyle, 1983; Dymond et al., 2007; Edelson & Reiser, 2006)

Figure 13.6 Jared, a fourth grader, is asked to write a brief letter to Abraham Lincoln.



Dear Mr. Lincoln,
you were a great
presadent. I'm glad
you freed the
slaves is it fun up
there in hevin

Yours truly,
Jared

When assigning tasks for students to complete at school, we might plan to ask them to use digital tools, as illustrated in the following examples:

- Word-processing programs can enhance the quality of students' essays and short stories.
- Databases can help students organize information about trees or planets.
- Spreadsheets can enable students to predict changes in weather patterns.
- Concept-mapping and brainstorming software can help students generate and organize ideas as they study for a test or write a research paper.

- Music software can help students create musical compositions and experiment with different keys, instrumental sounds, and time signatures.
- Geographic mapping software (known as *geographic information systems software,* or *GIS*) can be used to map data on pollutants or environmental wetlands. Google Earth is readily available, and allows students to explore virtually any area of the planet (www.google.com/earth) (Egbert, 2009; Guinee, 2003; Merrill et al., 1996; Sitko, 1998)

We must keep in mind, however, that such tools are most likely to be effective when students have already acquired some automaticity in keyboarding and other basic computer skills. Although many will have these skills, some may have had less opportunity to develop these competencies.

Giving Homework

Students can accomplish only so much during class, and homework provides a means through which we can extend the school day. Sometimes we may want to use homework to give students extra practice with familiar information and procedures (perhaps as a way of promoting review and automaticity) or to introduce them to new but simple material (Cooper, 1989). In other situations, we might give homework assignments that ask students to apply classroom material to their lives. For example, in a unit on area, we might ask students to calculate the area of two rooms in their home. We also might encourage students to bring items or ideas from home and use them as the basis for in-class activities (Alleman et al., 2010; Corno, 1996). When we ask students to make connections between classroom material and the outside world through homework assignments, we're potentially promoting transfer.

Doing homework appears to have a greater effect on achievement in the middle school and high school grades than in the elementary grades (Cooper et al., 2006). Although homework in elementary school may not enhance achievement very much, it can help students develop some of the study strategies and self-regulation skills they'll need in later years (H. Cooper & Valentine, 2001; Zimmerman, 1998). Without doubt, the *quality* of homework assignments—for instance, whether they encourage rote memorization or meaningful learning and whether students find them boring or engaging—makes an appreciable difference both in what and how much students learn and in what kinds of learning and self-regulating strategies they develop (Dettmers et al., 2010; Rawson et al., 2017; Trautwein et al., 2006). It's particularly important to not just assign questions or problems from the textbook without first evaluating the quality of those questions. A recent study examining math textbooks found that many actually have very few real-world problems that engage students in higher-order thinking (Schmidt et al., 2022).

When assigning homework, make sure you have a good reason for assigning it.

Assign homework to enhance automaticity of basic knowledge and skills, encourage review, introduce students to new but relatively simple material, or help students make connections between what they are learning in class and the outside world.

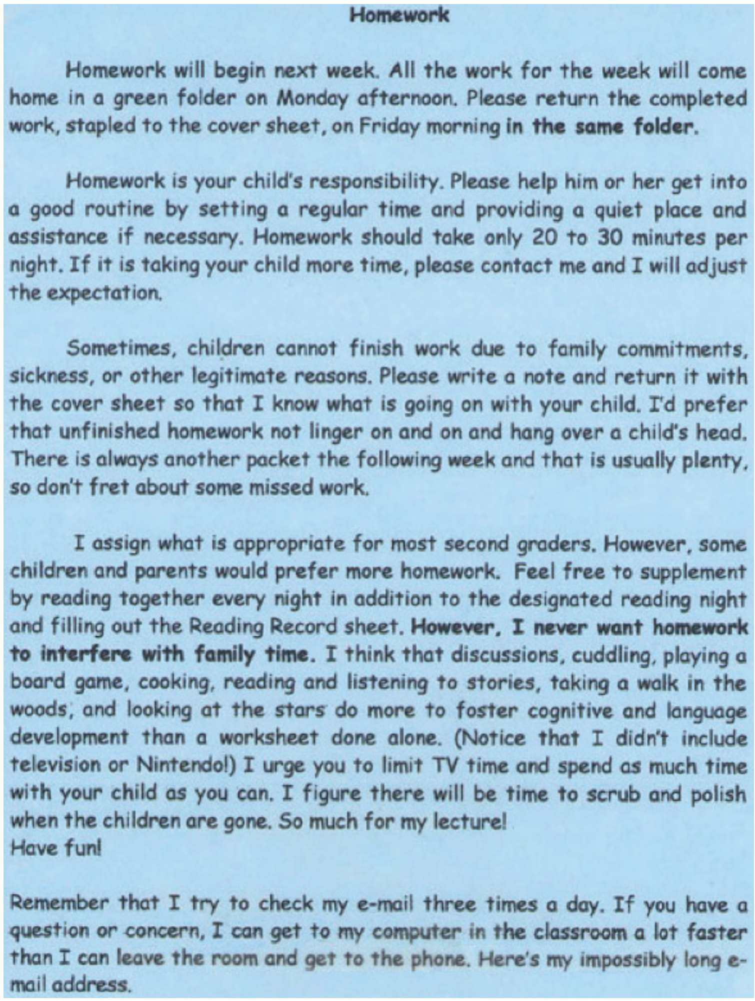
When assigning homework, we must remember that students are apt to differ considerably in the time and resources they have at home (e.g., reference books, internet access), in the amount and quality of assistance they can get from parents and other family members, and in the extent to which they have the motivation and self-regulation strategies to keep themselves on task (Dumont et al., 2012; Eilam, 2001; Fries et al., 2008; Xu, 2008). With these issues in mind, we authors offer the following guidelines:

- Use assignments primarily for instructional and diagnostic purposes; minimize the degree to which homework is used to assess learning and determine final class grades.
- Make homework sufficiently intriguing and challenging that students *want* to complete it; for example, give it an authentic, real-world quality, but don't make it so difficult that it leaves students confused and frustrated.
- Provide the information and structure students need to complete assignments with little or no assistance from others.

Giving extra homework as punishment for misbehavior communicates the message that schoolwork is unpleasant (see Chapter 6).

- When homework is completed online, students can benefit by having hints, clues, or cues built in to scaffold their learning. It's particularly helpful to provide both auditory and visual cues simultaneously (e.g., students can click a button that says "Hint," which leads them to see and hear a supportive message, such as "Refer to page 244 in your textbook to see a great example of how to solve this problem.").
- Provide high-quality homework assignments consistently, but remember that the quality of the assignment is much more important than the amount of time students need to spend on an assignment.
- Occasionally allow students to make choices (e.g., if you provide three problems for homework, allow them to choose two of the three problems to solve).
- Give a mixture of required and voluntary assignments. (Voluntary ones should help to give students a sense of autonomy and control, enhancing their intrinsic motivation.)
- Provide parents with information about your homework policies (see Figure 13.7).
- Discuss homework assignments in class the following day or as soon after that as possible.
- When students have poor self-regulation skills or limited resources at home, try to provide access to supervised after-school homework programs. (Alleman et al., 2010; Belfiore & Hornyak, 1998; H. Cooper, 1989; Cosden et al., 2001; Dettmers et al., 2011; Fernández-Alonso et al., 2015; Garbe & Guy, 2006; Patall et al., 2010; Rosário et al., 2015; Trautwein et al., 2006; Trautwein et al., 2009; Xie et al., 2019)

Figure 13.7 A second-grade teacher sends a letter home describing homework policies.



Homework

Homework will begin next week. All the work for the week will come home in a green folder on Monday afternoon. Please return the completed work, stapled to the cover sheet, on Friday morning **in the same folder.**

Homework is your child's responsibility. Please help him or her get into a good routine by setting a regular time and providing a quiet place and assistance if necessary. Homework should take only 20 to 30 minutes per night. If it is taking your child more time, please contact me and I will adjust the expectation.

Sometimes, children cannot finish work due to family commitments, sickness, or other legitimate reasons. Please write a note and return it with the cover sheet so that I know what is going on with your child. I'd prefer that unfinished homework not linger on and on and hang over a child's head. There is always another packet the following week and that is usually plenty, so don't fret about some missed work.

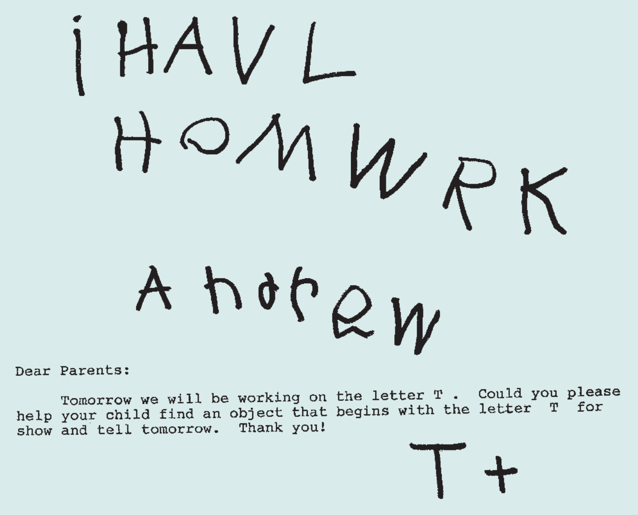
I assign what is appropriate for most second graders. However, some children and parents would prefer more homework. Feel free to supplement by reading together every night in addition to the designated reading night and filling out the Reading Record sheet. **However, I never want homework to interfere with family time.** I think that discussions, cuddling, playing a board game, cooking, reading and listening to stories, taking a walk in the woods, and looking at the stars do more to foster cognitive and language development than a worksheet done alone. (Notice that I didn't include television or Nintendo!) I urge you to limit TV time and spend as much time with your child as you can. I figure there will be time to scrub and polish when the children are gone. So much for my lecture!
Have fun!

Remember that I try to check my e-mail three times a day. If you have a question or concern, I can get to my computer in the classroom a lot faster than I can leave the room and get to the phone. Here's my impossibly long e-mail address.

Conducting Direct Instruction

Direct instruction incorporates all of the preceding strategies—expository instruction, asking questions, providing feedback, and giving in-class assignments and homework—to keep students continually and actively engaged in learning and applying classroom subject matter. To some extent, direct instruction is based on behaviorist ideas: It requires learners to make frequent responses and provides reinforcement of correct responses through teacher feedback. But it also capitalizes on principles from cognitive psychology, including the importance of attention and long-term memory storage processes in learning, the limited capacity of working memory, and the value of learning basic skills to automaticity. Sociocultural theory comes into play as well, in that a teacher can provide considerable scaffolding (especially at first) and might incorporate small-group activities into students' practice sessions.

Various experts describe and implement direct instruction somewhat differently. But in general, direct instruction usually involves most or all of the following components (Rosenshine, 2009; Rosenshine & Stevens, 1986):



i HAVL
HOMWRK
A ndrew

Dear Parents:

Tomorrow we will be working on the letter T . Could you please help your child find an object that begins with the letter T for show and tell tomorrow. Thank you!

T+

Young children don't always have the self-regulation skills they need to complete homework on their own. Six-year-old Andrew and his teacher jointly constructed the homework reminder shown here.

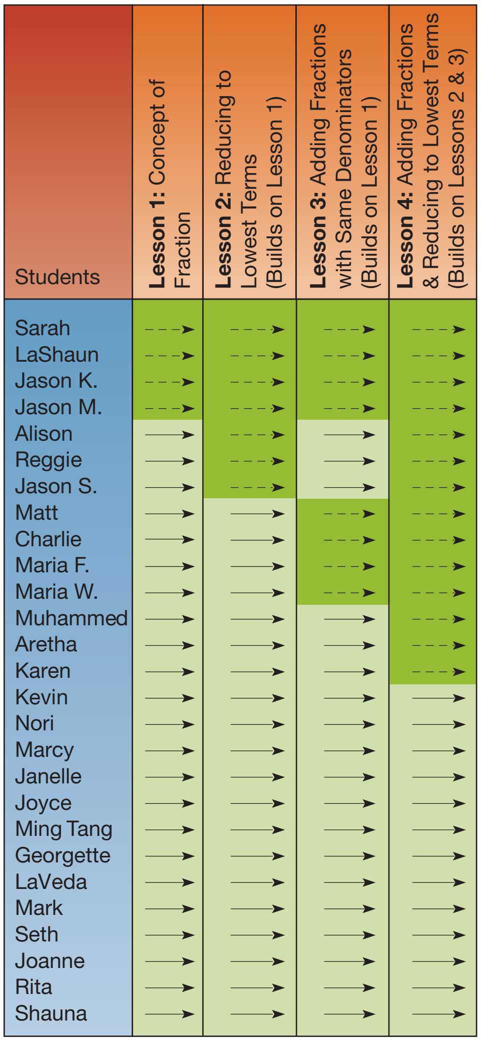
1. *Review of previously learned material.* The teacher reviews relevant content from previous lessons, checks homework assignments involving that content, and reteaches any information or skills that students haven't yet mastered.
2. *Statement of the current lesson's objectives.* The teacher describes one or more concepts or skills that students should master in the lesson.
3. *Presentation of new material in small, logically sequenced steps.* The teacher presents a small amount of information or a specific skill, perhaps through a verbal explanation, modeling, and one or more examples. The teacher may also provide an advance organizer, ask questions, or in other ways scaffold students' efforts to process and remember the material.
4. *Guided student practice and assessment after each step.* Students have numerous opportunities to practice what they're learning, perhaps by answering questions, solving problems, or performing modeled procedures. The teacher gives hints during students' early responses, provides immediate feedback about their performance, makes suggestions about how to improve, and provides additional instruction as needed. After students have completed guided practice, the teacher checks to be sure they've mastered the information or skill in question, perhaps by having them summarize what they've learned or answer a series of follow-up questions.
5. *Independent practice.* Once students have demonstrated some degree of competence, they engage in further practice either independently or in small cooperative groups. By doing so, they work toward achieving automaticity with the material.
6. *Frequent follow-up reviews.* Over the course of the year, the teacher provides opportunities for students to review previously learned material, perhaps through homework assignments, writing tasks, or quizzes.

Explicitly teach basic skills, giving lots of scaffolded practice and frequent feedback. As students gain competence, provide less-structured practice activities.

The teacher moves back and forth among these steps as necessary to ensure that all students are truly comprehending the subject matter.

Direct instruction is most suitable for teaching information and skills that are well defined and best taught in a step-by-step sequence (Rosenshine & Stevens, 1986; Spiro & DeSchryver, 2009). Because of the high degree of teacher–student interaction, it's often implemented more easily with small groups or in one-on-one tutoring sessions.

Figure 13.8 How the sequential and hierarchical nature of knowledge about fractions can affect students' learning.



Students	**Lesson 1:** Concept of Fraction	**Lesson 2:** Reducing to Lowest Terms (Builds on Lesson 1)	**Lesson 3:** Adding Fractions with Same Denominators (Builds on Lesson 1)	**Lesson 4:** Adding Fractions & Reducing to Lowest Terms (Builds on Lessons 2 & 3)
Sarah	⇢	⇢	⇢	⇢
LaShaun	⇢	⇢	⇢	⇢
Jason K.	⇢	⇢	⇢	⇢
Jason M.	⇢	⇢	⇢	⇢
Alison	→	⇢	→	⇢
Reggie	→	⇢	→	⇢
Jason S.	→	⇢	→	⇢
Matt	→	→	⇢	⇢
Charlie	→	→	⇢	⇢
Maria F.	→	→	⇢	⇢
Maria W.	→	→	⇢	⇢
Muhammed	→	→	→	⇢
Aretha	→	→	→	⇢
Karen	→	→	→	⇢
Kevin	→	→	→	→
Nori	→	→	→	→
Marcy	→	→	→	→
Janelle	→	→	→	→
Joyce	→	→	→	→
Ming Tang	→	→	→	→
Georgette	→	→	→	→
LaVeda	→	→	→	→
Mark	→	→	→	→
Seth	→	→	→	→
Joanne	→	→	→	→
Rita	→	→	→	→
Shauna	→	→	→	→

Especially in such circumstances, it can lead to substantial gains in achievement (Rittle-Johnson, 2006; Stockard et al., 2018; Watkins, 1997; Weinert & Helmke, 1995). Using direct instruction *exclusively* may be too much of a good thing, however, because students may get bored (for example, if we just present one drill-and-practice worksheet after another) (Mac Iver et al., 1995; Wasley et al., 1997).

Promoting Mastery

Imagine that a class of 27 students, listed in Figure 13.8, is beginning a unit on fractions. The class progresses through several lessons as follows:

Lesson 1: The class studies the basic idea that a fraction represents a part of a whole: The denominator indicates the number of pieces into which the whole has been divided, and the numerator indicates how many of those pieces are present. By the end of the lesson, 23 children understand what a fraction is. But Sarah, LaShaun, Jason K., and Jason M. are either partly or totally confused.

Lesson 2: The class studies the process of reducing fractions to lowest terms (e.g., 12/20 can be reduced to 3/5). By the end of the lesson, 20 children understand this process. But Alison, Reggie, and Jason S. haven't mastered the idea that they need to divide both the numerator and denominator by the same number. Sarah, LaShaun, and the other two Jasons still don't understand what fractions *are* and therefore have trouble with this lesson as well.

Lesson 3: The class studies the process of adding two fractions that have equal denominators (e.g., $1/20 + 11/20 = 12/20$). By the end of the lesson, 19 children can add fractions with the same denominator. However, Matt, Charlie, Maria F., and Maria W. keep adding the denominators together as well as the numerators (e.g., figuring that $1/20 + 11/20 = 12/40$). And Sarah, LaShaun, Jason K., and Jason M. continue to be puzzled about the general nature of fractions.

Lesson 4: The class combines the processes of adding fractions and reducing fractions to lowest terms. They must first add two fractions together and then, if necessary, reduce the sum to its lowest terms (e.g., after adding $1/20 + 11/20$, they must reduce the sum of 12/20 to 3/5). Here we lose Muhammed, Aretha, and Karen because they keep forgetting to reduce the sum to its lowest terms. And of course, we've already lost Sarah, LaShaun, Alison, Reggie, Matt, Charlie, the two Marias, and the three Jasons on prerequisite skills. *We now have only 13 of our original 27 students understanding what they're doing—less than half the class!* (See the rightmost column of Figure 13.8.)

Mastery learning is a variation of direct instruction in which students must demonstrate competence in one topic before proceeding to the next. It minimizes the likelihood of leaving some students behind as we proceed to increasingly challenging material (e.g., Bloom, 1981; Fuchs et al., 2005; Guskey, 1985, 2010; Guskey & Anderman, 2013; Zimmerman & Didenedetto, 2008). This approach is based on three assumptions:

- Almost every student can learn a particular topic to mastery.
- Some students need more time to master a topic than others.
- Some students need more assistance than others.

To promote mastery of a topic, break the subject matter into small, logically sequenced units, assess students' mastery of each one, and provide additional instruction and practice as needed.

As you can see, mastery learning represents a very optimistic approach to instruction: It assumes that most students *can* learn school subject matter if given sufficient time and instruction to do so.[3]

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[3] Don't confuse mastery *learning* with mastery *goals*. Here, we're talking about an instructional strategy. In contrast, mastery goals are an aspect of motivation: They reflect students' focus on gaining competence in the subject matter rather than on, say, simply getting a good grade.

In general, mastery learning includes the following components:

1. *Small, discrete units.* The subject matter is broken up into numerous brief lessons, with each lesson covering a small amount of material and aimed at accomplishing only a very small number of instructional objectives.
2. *A logical sequence.* Units are sequenced so that basic, foundational concepts and procedures are studied before more complex ones.
3. *Demonstration of mastery at the end of each unit.* Students move to a new unit only after they show mastery of the preceding one (e.g., by taking a quiz). Mastery is defined in specific, concrete terms (e.g., answering at least 90% of quiz items correctly).
4. *Additional activities for students needing extra help or practice to attain mastery.* Support and resources are tailored to individual needs and might include alternative approaches to instruction, different materials, specially tailored assignments, study groups, or individual tutoring.

Students engaged in mastery learning often proceed through units at their own speed; hence, different students may be studying different units at any given time. But it's also possible for an entire class to proceed through a sequence at the same rate: Students who master a unit more quickly than their classmates can pursue various enrichment activities, or they can serve as tutors for those still working on the unit (Block, 1980; Guskey, 1985).

Mastery learning has several advantages over other approaches to instruction. In particular, students tend to have a better attitude toward the subject matter, learn more, and perform at higher levels on classroom assessments. The benefits are especially striking for low-ability students (Guskey, 2010; Hattie, 2009; Kulik et al., 1990; Shuell, 1996). Mastery learning is most appropriate when the subject matter is hierarchical in nature—that is, when certain concepts and skills provide the foundation for future learning and genuine conceptual understanding. When instructional goals deal with such basics as word recognition, rules of grammar, arithmetic, or key scientific concepts, instruction designed to promote mastery learning may be in order. However, the very notion of mastery may be irrelevant to some long-term instructional goals. For example, skills related to critical thinking, scientific reasoning, and creative writing may continue to improve throughout childhood and adolescence without ever being completely mastered.

Using Internet Resources Effectively

Internet search engines such as Google and Yahoo! enable students and teachers to find instructional websites on virtually any topic. Many of these websites take the form of **hypermedia**, in that they enable students to look at a collection of topic-specific multimedia materials in a self-chosen sequence. Many government offices, public institutions, and private associations have websites that provide information, mini-lessons, and links to other relevant websites. Following are just a few of the innumerable possibilities:

U.S. Geological Survey (www.usgs.gov)
U.S. Census Bureau (www.census.gov)
National Aeronautics and Space Administration (www.nasa.gov)
National Museum of Natural History (www.mnh.si.edu)
Khan Academy (www.khanacademy.org)
Web-based Scientific Inquiry Environment (WISE) (www.wise.berkeley.edu)
National Center for Education Statistics (NCES) (nces.ed.gov)
The Library of Congress (www.loc.gov)

One especially noteworthy website on the preceding list is Khan Academy, which offers a large and growing collection of instructional videos on a wide variety of topics in math, science, economics, history, art, music, and computing. In addition, many high school students may find online courses available through Crash Course (https://thecrashcourse.com/) and other online providers useful.

Keep in mind, however, that students don't always have the self-regulation skills and technological literacy they need to learn effectively as they explore the many resources the internet offers (Azevedo & Witherspoon, 2009; Warschauer, 2011; Winters et al., 2008). Furthermore, the internet doesn't have a good quality-control mechanism to ensure that information is accurate, especially when posted by individuals rather than by government agencies or professional organizations. For example, there are many instructional videos available via YouTube, but the accuracy of the information in those videos may or may not be entirely correct. An additional concern is that some students may venture into unproductive domains, perhaps finding research papers they can pass off as their own (this is plagiarism), stumbling onto sites that preach racist attitudes or offer pornographic images, or sharing personal information with people who might jeopardize their well-being (Nixon, 2005; Schofield, 2006).

Scaffold students' early research on the internet, and monitor their explorations to ensure that they don't venture into inappropriate websites.

Clearly, then, students often need considerable scaffolding as they study a particular topic online, and their journeys into cyberspace should be closely monitored. Even in the secondary grades, students are apt to need considerable guidance about how to distinguish between helpful and unhelpful websites, sift through mountains of information in search of tidbits most relevant to their own purposes, critically evaluate the quality of the information they're finding, and synthesize what they discover into a cohesive, meaningful whole. As a teacher, you will inevitably have a student tell you, "I looked it up on the internet"; this is an opportunity for you to engage that student in some thoughtful conversation about these issues. (Afflerbach & Cho, 2010; Egbert, 2009; Kirschner & van Merriënboer, 2013; Leu et al., 2009).

See Chapter 8 for recommendations about how to foster effective metacognitive skills and critical thinking skills relevant to internet-based learning.

One effective way to focus students' internet searches is to share links to suitable websites on a class website or through the school's learning management system. Alternatively, we might use or create a **webquest** activity, in which students can use a number of predetermined websites as they tackle an interesting and challenging task requiring higher-level thinking skills; WebQuest.org provides links to many examples. In using such strategies, we should give students explicit instructional objectives they need to accomplish as they conduct their searches—for instance, by giving them specific questions to which they need to find answers (Niederhauser, 2008).

Also, many teachers can readily share their computer screens with the rest of the class. By doing so, teachers can provide students with demonstrations of how to use various internet resources. Many schools also have systems that allow teachers to view individual students' screens, so that the teacher can provide one-on-one support when needed. And if a particular student goes astray, we can lock their screen and send an appropriate message.

Promoting Deliberate Practice

We have all heard the expression, "Practice makes perfect." Few would argue with the fact that stellar athletes, musicians, and writers all spend time practicing their crafts. The typical student, however, does not have thousands of hours to practice each of the many skills that are learned in school.

Deliberate practice is an instructional technique that teachers can use to promote brief but effective periods of practice for skills that they are teaching. There are four essential characteristics of deliberate practice. First, the learner needs to have a specific goal; second, as the student practices, the practice questions should slightly exceed the learner's current level of skill; third, the learner should receive immediate feedback; and fourth, the learner should be encouraged to focus on correcting errors made along the way (Eskreis-Winkler et al., 2016). Deliberate practice is related to improved achievement and enhanced expectancy and value beliefs (e.g., Eskreis-Winkler et al., 2016).

Let's consider an example of what this might look like. Mr. Austin is teaching his sixth-grade students how to solve a simple algebraic equation. He knows from his experience that this is a difficult concept at first for some students. For example, if a student is asked to solve the equation:

$$\mathbf{14 - x = 6}$$

at first glance, the student probably won't understand why a letter ("*x*") is included in a math problem. Although this is obvious to older students and adults, it can be quite confusing to a younger child. Mr. Austin realizes that after some deliberative practice, this will become a less intimidating task for his students.

In order to encourage deliberative practice, Mr. Austin might do the following: First, he would make sure that each student knows that the goal of the current lesson is to learn how to figure out what the missing number is within a math problem; he might introduce the concept of a variable by noting that the letter "*x*" represents this missing number. The students would then practice a series of equations; Mr. Austin would start with easy ones, and arrange these so that each subsequent equation might be just a little more difficult than the previous one. The students also would receive immediate feedback on their performance on each equation, and be given the opportunity to correct mistakes as they occur (rather than after all of the problems are completed).

Helping Students Learn How to Learn

When we as teachers plan our lessons, we can actually incorporate ways to teach our students how to become better learners. These do not have to be stand-alone lessons; rather, we can teach effective self-regulation strategies within our regular lessons, if we plan in advance. In the following example, students have been asked to write a five-paragraph essay describing their favorite character from the book *To Kill a Mockingbird*. The teacher knows that her students have never written an essay like this before, so she incorporates some strategy instruction into her lesson. Here is how she introduces the lesson to her class:

> I hope you enjoyed reading *To Kill a Mockingbird*. As we discussed, there are several very interesting characters in this book. I'd like you to write a five-paragraph essay in which you describe your favorite character. You will need to explain why this is your favorite character. You also will need to include at least three specific examples from the book to help explain why you selected that character. So you should think about things that this character did that made an impression on you. Since you have never written an essay like this before, let me give you some suggestions about how to decide on the three examples. I suggest that you go back to your summary notes that you wrote for each chapter, and that you think about whether the character that you have chosen did something noteworthy in each chapter. Create a chart where you have chapter numbers on one side of the page, and a space for a brief summary of what the character did that impressed you. If the character didn't appear in some chapters, or didn't do anything noteworthy in a chapter, then just leave that blank. You will then have a list of examples, and you can then go back through your list and choose the three that are the most meaningful to you.

In this example, the class is studying a specific novel. However, the teacher uses this as an opportunity to instruct her students in using a cognitive strategy (i.e., going back over chapter notes to find specific examples that can be used in writing an essay). An effective teacher might then remind students about this strategy when they are writing an essay about another novel later in the year.

Chapter 8 discusses teaching self-regulation strategies to promote learning.

It may seem cumbersome to take the time to include strategy instruction in your lessons. However, rather than thinking about this as *additional content*, try to incorporate such instruction in your daily lessons. The example presented in Figure 13.9 is a writing assignment designed for fourth graders. Note that the teacher has incorporated specific

Table 13.1 Incorporating Effective Strategies into Instruction

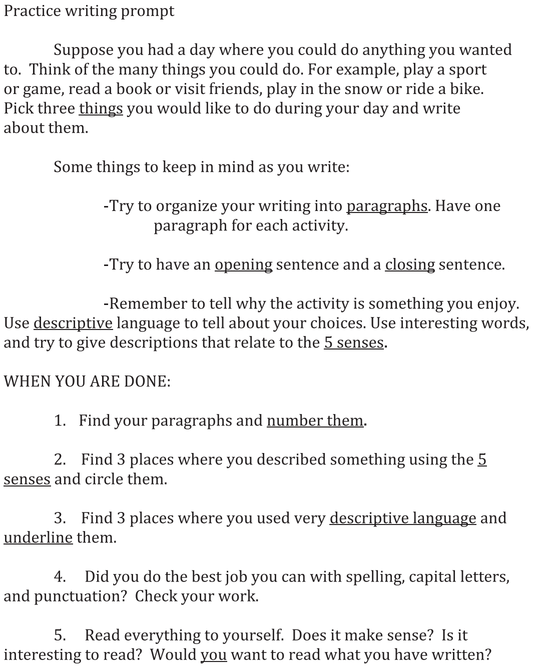
Strategy	Example of Strategy Incorporated into Instruction
Mastering prerequisite skills	Mr. Lopez provides ample opportunity for his students to practice their multiplication tables and learn them perfectly before starting to teach division. He builds practice time into his daily lessons for an entire month, and works individually with students to ensure that they are making progress.
Breaking complex problems down into a smaller set of sub-problems	The students in Mrs. Higgins' science class are creating mini waterfalls for their class project. Mrs. Higgins shows her students how to first come up with a list of all of the steps that they will need to take to complete the project. She gives the students 20 minutes per day for five days to work on their planning. She then reviews the plans, and permits her students to proceed with the actual project once they have identified all of the necessary steps.
Monitoring comprehension	The students in Ms. Oaks' biology class are learning about photosynthesis. Ms. Oaks assigns a chapter in the textbook that describes the photosynthesis process. She knows that this is a complex topic, so she asks her students to stop at the end of each section of the chapter, and to write a brief summary (no more than three sentences) of the main points covered in that section. She first builds in some classroom time in which she demonstrates this strategy to her students, and she then works with them throughout the week to ensure that they are using the strategy effectively.
Focusing attention	Mr. Ioane provides his students with a list of tips to help them to focus on the task at hand. The list is posted in the front and back of his classroom, and he puts this list on every assignment that he gives his students. He builds time into class at least twice per week to review and practice these strategies while his students are working on in-class assignments. The list includes the following tips: • Put away your phones and turn off the sound. • Don't listen to music or watch TV. • Take a short break when you become distracted. • Only work on one assignment at a time. • Avoid unnecessary conversations with friends.

SOURCES: Dunlosky et al., 2013; Fonseca & Chi, 2011; Lachner et al., 2020; Pressley & Woloshyn, 1999; VanderStoep & Pintrich, 2008.

writing strategies directly on to the assignment sheet; this makes it easy for the students to refer to the strategies, and for the teacher to remind the students about the strategies, while they are writing.

It is important to think about how you might incorporate some strategy instruction into your lessons. Table 13.1 provides a list of some of the strategies that we presented in earlier chapters, with examples of how teachers can plan their lessons so that strategy instruction is included.

Figure 13.9 In this writing activity, notice how the teacher has incorporated reminders about effective writing strategies within the actual assignment.



Practice writing prompt

Suppose you had a day where you could do anything you wanted to. Think of the many things you could do. For example, play a sport or game, read a book or visit friends, play in the snow or ride a bike. Pick three things you would like to do during your day and write about them.

Some things to keep in mind as you write:

-Try to organize your writing into paragraphs. Have one paragraph for each activity.

-Try to have an opening sentence and a closing sentence.

-Remember to tell why the activity is something you enjoy. Use descriptive language to tell about your choices. Use interesting words, and try to give descriptions that relate to the 5 senses.

WHEN YOU ARE DONE:

1. Find your paragraphs and number them.
2. Find 3 places where you described something using the 5 senses and circle them.
3. Find 3 places where you used very descriptive language and underline them.
4. Did you do the best job you can with spelling, capital letters, and punctuation? Check your work.
5. Read everything to yourself. Does it make sense? Is it interesting to read? Would you want to read what you have written?

Learner-Directed Instructional Strategies

Learning Objective 13.4 **Explain how you can also promote students' learning through more learner-directed strategies.**

By definition, learner-directed instruction places control of learning activities largely in students' hands. Yet for all but the most self-regulating of students, learner-directed instruction requires *some* teacher control and guidance, as we'll see in the upcoming sections.

Stimulating and Guiding Class Discussions

When students exchange ideas in whole-class or small-group discussions, they must elaborate on and organize their thoughts, may discover gaps and inconsistencies in their understandings, and may encounter explanations that are more accurate and useful than their own (e.g., Johnson & Johnson, 2009b; Reznitskaya & Gregory, 2013; Sinatra & Mason, 2008). Class discussions can be fruitful in virtually any academic discipline. For example, in language arts, students might discuss various interpretations of classic works of literature, addressing questions with no easy or definitive right answers (Applebee et al., 2003; McGee, 1992; Wu et al., 2013).

In social studies, discussing controversial topics (e.g., civil disobedience, capital punishment) can help students understand that diverse viewpoints on an issue may all have some legitimacy (Johnson & Johnson, 2009b; Kuhn & Crowell, 2011; Kuhn et al., 1997). And in science classes, discussions of various and conflicting explanations of observed phenomena can enhance students' scientific reasoning skills, promote conceptual change, and help students understand that science is a dynamic and continually evolving set of concepts and principles rather than just a collection of discrete facts (Bell & Linn, 2002; Hogan et al., 2000; Linn, 2008).

Learners' beliefs about the nature of science are examples of *epistemic beliefs* (see Chapter 8).

Although students typically do most of the talking in class discussions, teachers play critical roles, as illustrated in the following guidelines.

- *Focus on topics that lend themselves to multiple perspectives, explanations, or approaches.* Such topics appear to have several benefits: Students are more likely to express their opinions, seek out new information that resolves seemingly contradictory data, reevaluate their positions on issues, and develop a meaningful and well-integrated understanding of the subject matter (Applebee et al., 2003; Jadallah et al., 2011; Sinatra & Mason, 2008; C. L. Smith, 2007).
- *Make sure students have enough prior knowledge about a topic to discuss it intelligently.* This knowledge might come from either previous class sessions or students' personal experience. Often it comes from studying a particular topic in depth (Bruning et al., 1995; Onosko, 1996).
- *Create a classroom atmosphere conducive to open debate and the constructive evaluation of ideas.* Students are more likely to share their ideas and opinions if their teacher is supportive of multiple viewpoints and if disagreeing with classmates is socially acceptable and psychologically "safe" (Clark et al., 2003; Hadjioannou, 2007; Walshaw & Anthony, 2008). The following strategies can promote such an atmosphere:
  - Communicate that understanding a topic at the end of a discussion is more important than having a correct answer at the beginning of it.
  - Communicate that asking questions reflects curiosity; that differing perspectives on a controversial topic are both inevitable and healthy, and that changing one's opinion on a topic is a sign of thoughtful reflection.
  - Encourage students to explain and justify their reasoning and to try to understand one another's explanations.
  - Suggest that students build on one another's ideas whenever possible.
  - Encourage students to be open in their agreement or disagreement with classmates—that is, to agree to disagree—but to be critical of *ideas* rather than of people.
  - When students' perspectives reflect misconceptions or errors in reasoning, gently guide them toward more productive understandings.
  - Depersonalize challenges to a student's line of reasoning by framing questions in a third-person voice—for example, "What if someone were to respond to your claim by saying . . . ?"
  - Occasionally ask students to defend a position that's the opposite of what they actually believe.
  - Require students to develop compromise solutions that take into account opposing perspectives. (Cobb & Yackel, 1996; Hadjioannou, 2007; Hatano & Inagaki, 1993, 2003; Herrenkohl & Guerra, 1998; Hogan et al., 2000; Johnson & Johnson, 2009b; Kuhn, 2015; Lampert et al., 1996; Nussbaum, 2008; Staples, 2007; Walshaw & Anthony, 2008; Webb et al., 2008)

When students become comfortable with disagreeing in a congenial way, they often find the interactions highly motivating (Certo, 2011; Clark et al., 2003; Hadjioannou, 2007).

- *Create a class discussion board or chat room that enables students to converse about a topic or issue both in and out of school.* Such electronic mechanisms can be integral parts of a class website or learning management system and—if students have internet access at home—can easily extend the school day. Students should understand, however, that the rules for in-class discussions apply to electronic discussions as well. For example, students must accept that varying perspectives are both welcome and to be expected, and although they can certainly critique their classmates' ideas, they must do so respectfully and without ridicule (Bellanca & Stirling, 2011).
- *Use small-group discussions as a way of encouraging all students to participate.* Students gain more from a class discussion when they actively participate in it (Lotan, 2006; Murphy et al., 2009; O'Donnell, 1999). And they're more likely to speak openly when their audience is a handful of classmates rather than the class as a whole—a difference especially noticeable for girls and for students with disabilities (Clark et al., 2003; Théberge, 1994). On some occasions, then, we may want to have students first discuss an issue in small groups—thereby allowing them to test and possibly gain support for their ideas in a relatively private context—before bringing them together for a whole-class discussion (Onosko, 1996).
- *Provide a structure to guide the discussion.* Discussions are more productive when they have some sort of structure. For example, we might do the following:
  - Set a particular goal toward which students should work.
  - Assign different roles to different class members (e.g., some might serve as "recorders" of the group's discussion, others might evaluate the quality of evidence presented, and still others might evaluate the validity of conclusions).
  - Before conducting an experiment for the entire class to watch, ask students to make and defend predictions about what will happen; later, ask them to explain what actually happened and why. (Beck & McKeown, 2001; Calfee et al., 1994; Hatano & Inagaki, 1991; Herrenkohl & Guerra, 1998; Nolen, 2011; Palincsar & Herrenkohl, 1999; Smith, 2007; White & Frederiksen, 1998)

  At the same time, we must recognize that the most effective group discussions are often those in which students have some control over the direction of discourse—perhaps asking their own questions, initiating new issues related to the topic, or taking a creative but risky approach or viewpoint (Aulls, 1998; Chiu, 2008; Hogan et al., 2000). Learner-directed discussions are also more likely to encourage effective group interaction skills (Anderson et al., 2001). For example, when elementary school students meet in small, self-directed groups to discuss children's literature, they can develop and model such skills as expressing agreement ("I agree with Kordell because . . ."), disagreeing tactfully ("Yeah, but they could see the fox sneak in"), justifying an opinion ("I think it shouldn't be allowed, because if he got to be king, who knows what he would do to the kingdom"), and seeking everyone's participation ("Ssshhh! Be quiet! Let Zeke talk!") (Anderson et al., 2001, pp. 16, 25; Certo, 2011; Clark et al., 2003).

  Ultimately, the amount of structure we impose must depend on how much scaffolding students need to have a productive discussion. For instance, we may want to be more directive with a small discussion group that seems to be unfocused and floundering than with one in which students are effectively articulating, critiquing, and building on one another's ideas (Hogan et al., 2000).
- *Provide closure at the end of the discussion.* Even when the topic of discussion has no single right answer, a class discussion should have some form of closure that helps students tie various ideas together. For example, when we authors conduct discussions about controversial topics in our own classes, we often spend a few minutes at the end of class summarizing important ideas that students have identified. Another, more learner-directed approach is to have students summarize the key issues themselves, perhaps uploading their thoughts to a class website.

Conducting Reciprocal Teaching Sessions

Discussions not only encourage students to think about and process subject matter more thoroughly but also can promote more effective metacognitive strategies during reading and listening activities (Brown & Reeve, 1987; Murphy et al., 2011; Nussbaum, 2008). One form of discussion, **reciprocal teaching**, is especially effective in this regard. It focuses on promoting four metacognitive strategies during reading:

- *Summarizing:* Identifying the main ideas of a reading passage.
- *Questioning:* Asking oneself questions to make sure one understands a reading passage—that is, engaging in comprehension monitoring.
- *Clarifying:* Taking active steps to make sense of confusing or ambiguous parts of a passage, perhaps by re-reading.
- *Predicting:* Anticipating what is likely to come next based on cues in the text (e.g., headings) and ideas that have already been presented. (Palincsar, 2013; Brown & Palincsar, 1987; Palincsar & Brown, 1984, 1989; Palincsar & Herrenkohl, 1999)

When reading a story or textbook with students, ask questions that promote summarizing, questioning, clarifying, and predicting. Gradually turn the role of question-asking over to students.

In a typical reciprocal teaching session, a teacher and several students meet in a group to read a piece of text, occasionally stopping to discuss what they're reading. Initially the teacher leads the discussion, asking questions about the text to promote summarizing, questioning, clarifying, and predicting. But gradually the role of "teacher" is turned over to different students, who then take charge of the discussion and ask one another the kinds of questions their teacher has modeled. Eventually students can read and discuss a text almost independently of their teacher: They work together to construct meaning and check one another for comprehension and possible misunderstandings, and they become increasingly flexible in how they apply their newly acquired strategies (Brown & Palincsar, 1987; Palincsar & Herrenkohl, 1999). Students usually take turns reading sections of the text being discussed. Sometimes, however, the teacher reads the text, especially when working with novice readers. Reciprocal teaching provides a mechanism through which both the teacher and the students can model effective reading and thinking strategies; hence, this approach has an element of social cognitive theory. But when we consider that we're encouraging effective cognitive processes by first having students practice them aloud in group sessions, we realize that sociocultural theory is also at work here: Students should eventually *internalize* processes they first use in their discussions with others. Furthermore, the structured nature of a reciprocal teaching session scaffolds students' efforts to make sense of what they read and hear.

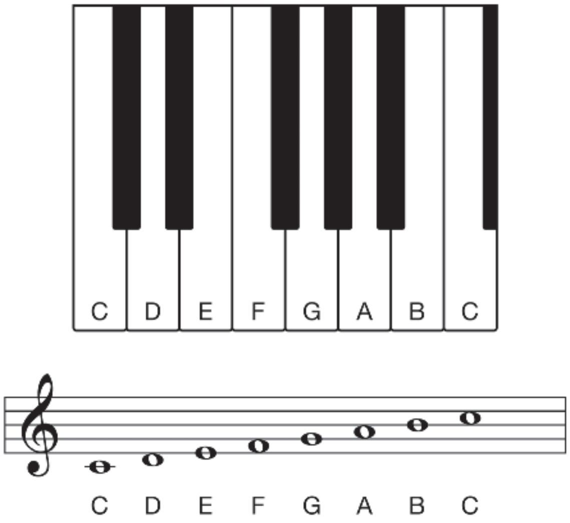
Reciprocal teaching promotes more effective reading and listening comprehension skills in students at all grade levels, and in English language learners as well as native English speakers (Alfassi, 2004; Johnson-Glenberg, 2000; Palincsar & Brown, 1989; Rosenshine & Meister, 1994; Slater, 2004). We shouldn't think of reciprocal teaching as something that only reading teachers use. It also has been used successfully in science classes (where teachers have adapted it for whole-class discussions of passages in science textbooks) and math classes (where teachers have adapted it to help students make sense of complex word problems) (Brown & Palincsar, 1987; van Garderen, 2004). Furthermore, reciprocal teaching sessions can be conducted online as well as in the classroom (Reinking & Leu, 2008). Effectively using reciprocal teaching may take some practice, however. It may also require a concerted effort to make sure that students do, in fact, generate and model higher-level questions as well as lower-level ones (e.g., Hacker & Tenent, 2002).

Conducting Discovery and Inquiry Activities

In **discovery learning**, students derive information for *themselves*—perhaps by randomly exploring and manipulating objects or perhaps by performing systematic experiments. Hands-on discovery experiences can often convey ideas that language alone can't fully communicate.

In his theory of cognitive development, Jean Piaget suggested that effective discovery learning should be largely a child-initiated and child-directed effort. However,

Figure 13.10 Exploring the relationships between musical notes and the production of music.



Peter Hermes Furian/Shutterstock

Students use real keyboards with notes indicated for each key, and play sheet music at different stations throughout the classroom. *Activity created by Jacob Anderman, 2022.*

researchers have been finding that in classroom settings, students typically benefit more from carefully planned and structured activities that help them construct appropriate interpretations (Alfieri et al., 2011; Brown et al., 2009; Hardy et al., 2006; Mayer, 2004). Figure 13.10 provides an example of a discovery learning activity designed for middle and high school general music students. In this activity, several small keyboards are set up around the perimeter of the classroom with letters (representing musical notes) superimposed on the keys. At each station, students are presented with a piece of sheet music with the corresponding letters provided for each note. Students try playing these short pieces at each keyboard and are asked to try to identify the song that they are playing (e.g., recognizable songs such as *Mary Had a Little Lamb, London Bridge, The Alphabet Song*, and *Lightly Row*). Through this activity, students begin to discover how to read music and to apply that skill to producing music on a keyboard, while also beginning to learn about musical pitch and simple rhythmic structures.

A variation of discovery learning, **inquiry learning**, typically has the goal of helping students acquire more effective *reasoning processes* either instead of or in addition to acquiring new information. For example, to help students learn to separate and control variables in scientific investigations, we might have them design and conduct experiments related to, say, factors affecting how fast a pendulum swings or how far a ball travels after rolling down an inclined plane. And we might foster critical thinking skills in history by having students read historical documents with the mindset that they are reading *interpretations* rather than facts and therefore must look for evidence that either supports or disconfirms those interpretations. Such activities can often promote more advanced reasoning skills, especially when combined with appropriate instruction and scaffolding (Furtak et al., 2012; Levstik, 2011; Lorch et al., 2010; Monte-Sano, 2008).

Discovery and inquiry activities need not be limited to materials we have available in the classroom. With access to the internet, our options for discovery and inquiry activities are virtually unlimited. For example, one of us authors and her middle school geography students once used the U.S. Geological Survey website (www.usgs.gov) to track the path of a hurricane as it made its way through the Caribbean and up the Atlantic Coast. Similarly, data available from the U.S. Census Bureau (www.census.gov) can enable students to explore issues related to population growth and poverty. Data from the Centers for Disease Control and Prevention (www.cdc.gov) can enable students to delve into issues related to Covid-19, cancer, and other health-threatening conditions.

At the same time, we must note a few potential problems with discovery learning and inquiry learning activities. First, students don't always have sufficient reasoning and metacognitive skills to effectively direct their explorations and monitor their findings (de Jong, 2011; Plass et al., 2010; White et al., 2009). Second, students may be overwhelmed by the many facets and subfacets of what they're observing—an issue of *cognitive load*—to the point that they can't adequately think about and sort through all the data available to them (Moreno & Park, 2010). Third, students may construct incorrect understandings from their discovery and inquiry activities; for instance, they may misinterpret or distort the evidence they gather in an experiment so that it seemingly "supports" their existing misconceptions (de Jong & van Joolingen, 1998; Karpov, 2003). Finally, such activities often take considerably more time than direct instruction, and teachers may feel torn between providing hands-on experiences and covering all topics in a school-mandated curriculum (Klahr, 2009; Linn, 2008).

In our own experiences, we authors have found that students sometimes remember what they learn in hands-on activities so much more effectively than what they learn through expository instruction alone that the extra time we occasionally devote to these activities is time well spent—an instance of the *less-is-more* principle. The Into the Classroom feature "Effectively Using Discovery and Inquiry Learning Activities" offers several suggestions for maximizing the advantages and minimizing the potential shortcomings of these approaches.

Into the Classroom

Effectively Using Discovery and Inquiry Learning Activities

- **Identify a concept or principle about which students can learn something significant through interaction with their physical or social environment.**

  In a unit on erosion, a sixth-grade teacher sets a 4-foot-long tray at a slight incline at the front of the classroom. The tray contains quite a bit of sand at its higher end. In a series of experiments, students pour water into the tray's higher end and look at how varying water pressures and quantities differentially affect sand movement.

- **Make sure students have the necessary prior knowledge to make sense of what they observe.**

  A high school physics class studies basic principles of velocity, acceleration, and force. In a follow-up lab activity, students place metal balls of various weights and sizes at the top of an inclined plane and observe each ball's progress as it rolls down the slope. A computer attached to the plane enables the students to measure the rate of acceleration for each ball, thereby also enabling them to determine whether either weight or size influences acceleration. From the data, the students can draw conclusions about the effects of gravity.

- **Explicitly teach reasoning processes, such as separation and control of variables in science or critical analysis of historical documents in history.**

  A high school history teacher gives students copies of 12 political cartoons that appeared in U.S. newspapers at various times during the Vietnam War. He first reminds students about previous lessons regarding the personal biases that underlie many human-created historical documents. He then explains the symbolic nature of political cartoons and common symbols used in them. Finally, he asks students to work in small groups to identify pro-war or anti-war messages in the cartoons, as well as possible trends in the cartoonists' opinions over time.

- **Show puzzling results to create disequilibrium and arouse curiosity.**

  A science teacher shows her class two glasses of water. In one glass, an egg floats at the water's surface; in the other glass an egg rests on the bottom. The students hypothesize that one egg has more air inside and is lighter as a result. But then the teacher switches the eggs into opposite glasses. The egg that the students believe to be heavier now floats, and the supposedly lighter egg sinks to the bottom. The students are quite surprised and demand to know what's going on. (Ordinarily, water is less dense than an egg, so an egg placed in it will quickly sink. But in this situation, one glass contains saltwater—a mixture denser than an egg and thus capable of keeping it afloat.)

- **Simplify, structure, and guide the experience sufficiently that students proceed logically toward discoveries you want them to make.**

  To demonstrate the effects of heat on evaporation, a seventh-grade science teacher divides her class into four groups, and gives each group a beaker with equal amounts of water. The teacher randomly assigns each group to one of these four conditions: (a) put the beaker into the refrigerator, (b) leave the beaker out in the classroom at room temperature, (c) heat the beaker with a weak heat source, and (d) heat the beaker with a strong, very hot heat source. After 15 minutes, the teacher asks each group to measure the amount of water in their beakers. The teacher asks the students to share their findings, and to explain why some beakers now have less water in them.

- **Have students record their findings.**

  Students in a biology class collect data from a local stream and use handheld wireless devices to send their findings to a central class computer. Once back in the classroom, the students consolidate and graph the data and look for general patterns and trends.

- **Help students relate their findings to concepts and principles in the academic discipline they are studying.**

  After students in a social studies class have collected data on average incomes and voting patterns in different counties within their state, their teacher asks, "How can we interpret these data given what we've learned about the relative wealth of members of the two major political parties?"

- **Actively address and correct any erroneous conclusions that students draw from their observations.**

  In a whole-class discovery activity regarding the nature of air, a first-grade teacher fills a glass with water and holds an index card across its top. When she turns the glass upside down and then gently removes her hand, the card continues to hold the water in the glass. The students are quite surprised, and some students suggest that the water is acting like "glue" that holds the card in place. The teacher gently nudges the students toward a better explanation: *Air* is holding the card *up*. She then has students work in small groups to explore this phenomenon on their own.

SOURCES: Boxerman, 2009 (erosion example); Bruner, 1966; de Jong & van Joolingen, 1998; N. Frederiksen, 1984a; Furtak et al., 2012; Hardy et al., 2006; Kirschner et al., 2006; Klahr, 2009; Leach & Scott, 2008; Linn & Eylon, 2011; Minstrell & Stimpson, 1996; Monte-Sano, 2008; Moreno, 2006; Palmer, 1965 (egg example); Pea & Maldonado, 2006 (stream example); Schwartz & Martin, 2004; White & Frederiksen, 1998, 2005.

Conducting Cooperative Learning Activities

In your many years as a student, you've undoubtedly had a variety of incentives to do well in your classes. In the next exercise you'll consider three possibilities.

Experiencing Firsthand

Falling Rocks

Imagine yourself as a student in each of the three classrooms described here. What would you do in each situation?

1. Mr. Schultz tells your class, "Let's find out which students can learn the most in this week's unit on the human nervous system. The three students getting the highest scores on Friday's quiz will get free tickets to see the new Spiderman movie on Saturday."
2. Ms. Yu introduces her lesson this way: "I'm hoping that all of you will master the basics of the human nervous system this week. If you get a score of at least 90% on Friday's quiz, I'll give you a free ticket to the new Spiderman movie.
3. Mr. Gonzalez begins the same lesson like this: "Beginning today, you'll be working in groups of three to study the human nervous system. On Friday I'll give you a quiz to see how much you've learned. If all three members of your group score at least 90% on the quiz, everyone in your group will get free tickets to the new Spiderman movie."

In which class(es) are you likely to work hard to get free tickets to see Spiderman? How might you work *differently* in the three situations?

The first class (Mr. Schultz's) is obviously a very competitive one: Only the three best students are getting tickets to the movie. Will you try to earn one of those tickets? It all depends on what you think your chances are of being a top scorer on Friday's quiz. If you've been doing well on quizzes all year, you'll undoubtedly study harder than ever during this week's unit. If, instead, you've been doing poorly in class despite your best efforts, you probably won't work for something you're unlikely to get. But in either case, will you help your fellow students learn about the nervous system? Probably not if you want to go to the movie yourself!

In Ms. Yu's class, there's no competition for movie tickets. As long as you get a score of 90% or higher on the quiz, you'll get a ticket. But will you help your classmates understand what neurotransmitters are? Maybe—*if* you have the time and are feeling altruistic.

Now consider Mr. Gonzalez's class. Your getting a movie ticket depends on how well you *and two other students* score on Friday's quiz. Are you going to help those two students learn about neurons and dendrites? And can you expect them, in turn, to help you understand where the spinal cord fits into the whole system? Absolutely!

In **cooperative learning**,[4] students work in small groups to achieve a common goal. Unlike an individualistic classroom such as Ms. Yu's (where one student's success is unrelated to peers' achievement) or a competitive classroom such as Mr. Schultz's (where one student's success depends partly on the *failure* of others), students in a cooperative learning environment such as Mr. Gonzalez's work together to achieve joint successes. On some occasions, cooperative groups are formed on a short-term basis to accomplish specific tasks—perhaps to study new material, solve a problem, or complete an assigned project. In other instances, groups are formed to work toward long-term goals. (Johnson & Johnson, 1991).

When students engage in cooperative learning, they reap the many benefits of interacting with one another, including greater comprehension and integration of the subject matter, exposure to new strategies, and increased perspective taking. Furthermore, when students help one another learn, they provide scaffolding for one another's efforts and thus tend to have higher self-efficacy for accomplishing challenging tasks. And, of course, cooperative learning activities can provide valuable experience with the collaboration and negotiation skills that success in the adult world often requires (Good et al., 1992; Johnson & Johnson, 2009a; O'Donnell & O'Kelly, 1994; Webb & Palincsar, 1996; White & McVeigh, 2010).

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[4] Some theorists distinguish between *cooperative* learning and *collaborative* learning, with different theorists drawing the dividing line somewhat differently. In this chapter, we're using cooperative learning broadly to include collaborative approaches to learning.

When designed and structured appropriately, cooperative learning activities can promote high achievement in students of all ability levels, including many who have historically been at risk for academic failure. They're especially suitable for complex, challenging tasks and problems in which group members can share the cognitive load and model effective learning and problem-solving strategies for one another. Students also can engage in **collaborative social reasoning** when working in cooperative groups: Students in the group take various positions on an issue, and then they present evidence that allows them to argue for their positions (Baker et al., 2017; Chinn et al., 2001; Lin et al., 2022). Students (as opposed to the teacher) take the lead in directing these discussions. The goal here is not to arrive at an overall conclusion—rather, the goal is to engage in an enriching discussion (Chinn & Anderson, 1998; Wu et al., 2013).

Cooperative learning activities can have other desirable outcomes as well, such as increased self-efficacy for academic success and more productive relationships with classmates from diverse ethnic and socioeconomic backgrounds (e.g., Ginsburg-Block et al., 2006; F. Kirschner et al., 2009; Lou et al., 2001; Pfeifer et al., 2007; Qin, Johnson, & Johnson, 1995; Stevens & Slavin, 1995; Vaughn et al., 2011).

We should note some potential downsides of cooperative learning, however. Some students may be more interested in achieving social and performance goals (e.g., creating a good impression, getting the right answer quickly) than they are in mastering the material; consequently, they might be unwilling to ask for help or assist their classmates (Levy et al., 2000; Moje & Shepardson, 1998; Wentzel, 2009). In addition, students who do most of the work and most of the talking are likely to learn more than other group members (Lotan, 2006; Webb, 1989). Furthermore, students may occasionally agree to use an incorrect strategy or method that a particular group member has suggested, or they may share misconceptions about a topic they're studying (Good et al., 1992; Stacey, 1992). And in some cases students simply don't have the skills to help one another learn (Ladd et al., 2014; Webb & Mastergeorge, 2003). Clearly, then, we must keep a close eye on collaborative groups, providing structure and guidance as necessary.

Following are several strategies that can enhance the effectiveness of cooperative learning groups.

- *Form groups based on knowledge about which students are likely to work effectively with one another.* Cooperative groups typically comprise two to six members; groups of three to four students are especially effective (Hatano & Inagaki, 1991; Lou et al., 1996). In most cases, we teachers should form the groups, identifying student combinations that will be productive (Johnson & Johnson, 1991; Lotan, 2006). Some advocates of cooperative learning suggest that groups be heterogeneous, with each group including high achievers and low achievers, a mix of gender identities, and children of various ethnic backgrounds. Others disagree, arguing that too much heterogeneity makes students' differing ability levels obvious and discourages low-ability students from actively participating (Lotan, 2006; Moje & Shepardson, 1998; O'Donnell & O'Kelly, 1994; Webb et al., 2002).

  Research regarding the effects of heterogeneous cooperative groups has yielded mixed results. Some studies indicate that heterogeneous groups benefit both high-achieving students (who can sharpen their knowledge by explaining material to peers) and low-achieving students (who benefit from hearing such explanations) (Lou et al., 1996; Murphy et al., 2017; Stevens & Slavin, 1995; Webb et al., 1998; Webb & Palincsar, 1996). However, other studies indicate that high-achieving students *don't* always gain from working with low-achieving classmates and can

Identify cooperative activities that require multiple talents and skills, and create groups in which all members can help one another and contribute meaningfully to the group's overall success.

occasionally even lose ground (Hogan & Tudge, 1999; Lou et al., 1996; Webb et al., 2002). Ideally, cooperative group activities require a sufficiently wide range of talents and skills that every group member has something unique and useful to contribute to the group's overall success (Cohen, 1994; Esmonde, 2009; Lotan, 2006).

- *Give group members one or more common goals toward which to work.* Effective cooperative learning activities have clear, concrete goals regarding what each group should accomplish (Crook, 1995; Slavin et al., 2003). For example, a foreign language teacher can break students into small groups, and ask each group to write a *Saturday Night Live* type skit in Spanish. The students know that ultimately they will perform the skits in costume and be video-recorded, and that the skits will be combined into a *Saturday Night Live* episode that will be shared with the other Spanish classes.
- *Provide clear guidelines about how to behave.* Cooperative learning is more successful when students act respectfully and prosocially toward one another. Following are possible guidelines to provide:
  - Listen to other group members politely and attentively.
  - Ask questions when you don't understand something.
  - Encourage other group members in their efforts, and offer assistance as needed.
  - Address differences of opinion in respectful and constructive ways (e.g., "I'm curious why you chose to begin with this…").
  - Change your mind when others present persuasive arguments and evidence.
  - Whenever possible, identify compromises that pull together differing perspectives. (Berger, 2003, p. 94; Deutsch, 1993; Gillies & Ashman, 1998; Lotan, 2006; Lou et al., 1996; O'Donnell & O'Kelly, 1994; Webb & Farivar, 1999)
- *Structure tasks so that group members must depend on one another for success.* Students must believe that it's to their advantage to cooperate and help other group members learn. In some situations, each student might have a unique and essential function within the group, perhaps serving as group leader, critic, bookkeeper, peacekeeper, or summarizer (Esmonde, 2009; Johnson & Johnson, 1991; Lotan, 2006). In other situations, the **jigsaw technique** is useful: New information is divided equally among all group members, and each student must teach their portion to the others. A jigsaw approach can be quite effective *provided that* students give one another adequate instruction in the material they've studied, and provided that social comparisons between students in the group are minimized (Aronson & Patnoe, 1997; Roseth et al., 2019; Slavin, 2011).

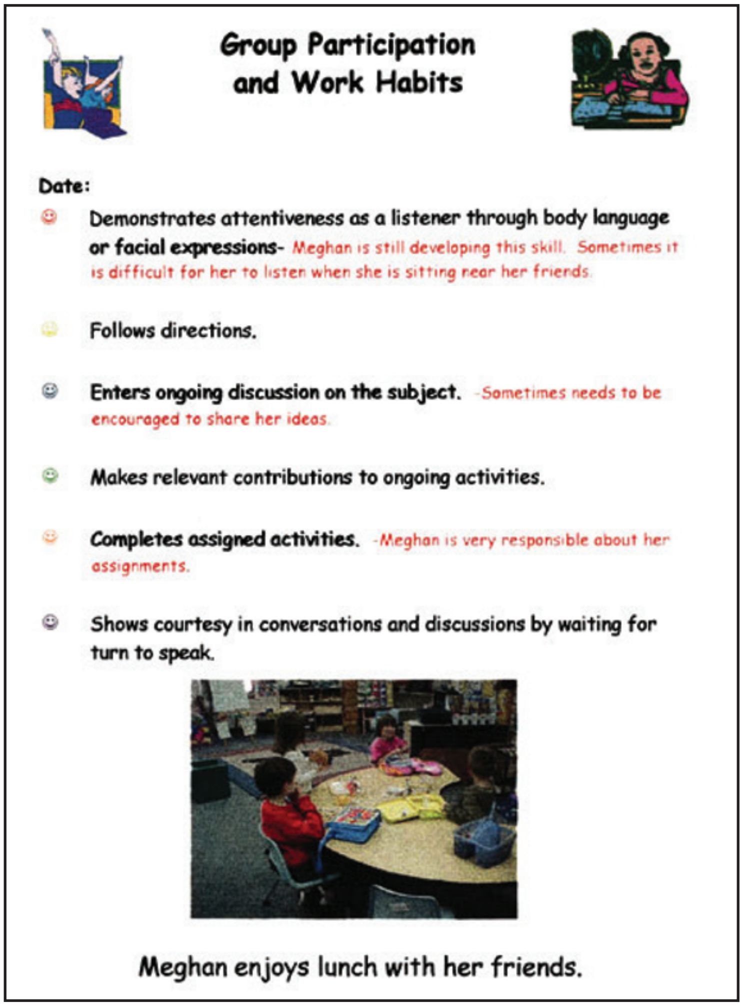
  When students are novices at cooperative learning, it's often helpful to give them a set of steps—a script to follow, if you will—that guides their interactions (Gillies, 2003; Ginsburg-Block et al., 2006; O'Donnell, 2006). In one simple approach, known as **scripted cooperation**, students work together in pairs to read and study expository text. One member of the pair might act as *recaller,* summarizing the contents of a textbook passage, while the other student acts as *listener,* correcting any errors and recalling additional important information. The two students switch roles for the subsequent passage. Such an approach can help students improve learning strategies such as elaboration, summarizing, and comprehension monitoring (Dansereau, 1988; O'Donnell, 1999).
- *Serve primarily as a resource and monitor.* Whenever we conduct a cooperative learning activity, we should provide any assistance and scaffolding necessary to keep groups on track toward meeting their goals (Williams, 2010). We must also monitor group interactions to ensure that they are productive and socially appropriate (Johnson & Johnson, 1991). For instance, if students seem to be buying into a classmate's misconception about a topic, a gentle intervention can steer a discussion in a more fruitful direction (e.g., "Natasha thinks such-and-such; do the rest of you agree with that?"). If a student makes hurtful remarks to a classmate, a reminder

about the rules for behavior—and in some cases a request for an apology—may be in order. Too much intervention can be counterproductive, however: Students often tend to talk less with one another when their teacher joins the group (Cohen, 1994).

- *Make students individually accountable for their achievement, but also reinforce them for group success.* Students are more likely to learn assigned subject matter during cooperative learning activities when they know they'll have to demonstrate individual mastery or accomplishment of the group's goal—for example, by answering questions in class, taking a quiz, or making a unique and easily identifiable contribution to an overall group product. Such an approach minimizes the likelihood that some students will do most or all of the work while others contribute little or nothing (Finn et al., 2003; Ginsburg-Block et al., 2006; Johnson & Johnson, 2009a).

  But, in addition, we might reinforce group members for the success of the group as a whole—a *group contingency* (Lou et al., 1996; Slavin, 2011). Such group rewards often promote higher achievement overall, perhaps because students have a vested interest in one another's performance and thus make a concerted effort to help fellow group members understand the subject matter (Stevens & Slavin, 1995).
- *At the end of an activity, have groups evaluate their effectiveness.* After cooperative groups have accomplished their goals, we should have them look analytically and critically (perhaps with our assistance) at the ways in which they've functioned effectively and the ways in which they need to improve (Cohen, 1994; Deutsch, 1993; Johnson & Johnson, 2009a). Sometimes it's helpful to ask group members to each write a paragraph about the effectiveness of the group. In addition, you can provide parents with feedback on how well their child participated in group activities. See Figure 13.11 for an example.

Figure 13.11 Meghan's first-grade teacher provides feedback to her parents about how well she participates in group activities.



Group Participation and Work Habits

Date:

☺ **Demonstrates attentiveness as a listener through body language or facial expressions-** Meghan is still developing this skill. Sometimes it is difficult for her to listen when she is sitting near her friends.

☺ **Follows directions.**

☺ **Enters ongoing discussion on the subject.** -Sometimes needs to be encouraged to share her ideas.

☺ **Makes relevant contributions to ongoing activities.**

☺ **Completes assigned activities.** -Meghan is very responsible about her assignments.

☺ **Shows courtesy in conversations and discussions by waiting for turn to speak.**

Meghan enjoys lunch with her friends.

See Chapter 6 for a discussion of group contingencies.

Structuring Peer Tutoring Sessions

In **peer tutoring**, students who have mastered a topic teach those who have not. On some occasions, we might have students within a single class tutor one another; at other times, we might have older students teach younger ones—perhaps high school students teaching students in kindergarten or first grade. One of the authors of this book ran such a program, in which high school Advanced Placement Spanish students taught conversational Spanish to first graders at a neighboring elementary school. Additionally, we might create a schoolwide tutoring program.

When you use peer tutoring, try not to reinforce the idea that some students are "smart" and some are "dumb."

Peer tutoring sessions can provide a context in which struggling students can more easily ask questions and get immediate feedback about their performance. But the tutors often benefit as well, in part because they can practice using and elaborating on their newly acquired knowledge and skills. Furthermore, in the process of directing and guiding other students' learning and problem solving, tutors may *internalize* these processes (as sociocultural theorists would predict) and thus become better able to direct and guide their *own* learning and problem solving. In other words, peer tutoring can foster greater self-regulation in the tutors. Accordingly, both the tutors and the students they tutor are likely to show significant academic gains (Graesser et al., 2011; O'Donnell, 2006; Robinson et al., 2005; Roscoe & Chi, 2007; Sullivan & Conoley, 2004).

Peer tutoring has nonacademic benefits as well. Cooperation and other social skills improve, behavior problems diminish, and friendships form among students of different ethnic groups and between students with and without disabilities (Cushing & Kennedy, 1997; DuPaul et al., 1998; Greenwood et al., 1988; Robinson et al., 2005).

Following are several research-based recommendations for enhancing the effectiveness of peer tutoring.

- *Make sure that tutors have mastered the material they are teaching and that they use sound instructional techniques.* In most cases, effective tutors have a solid understanding of the subject matter they're teaching and can provide explanations that focus on meaningful (rather than rote) learning. Good tutors also use teaching strategies that are likely to promote learning; for instance, they ask questions, give hints, scaffold responses when necessary, and provide constructive feedback (Fuchs et al., 1996; Lepper et al., 1990; Roscoe & Chi, 2007).

  Especially in the elementary grades, explicit training in tutoring skills can be helpful. For example, student tutors might be shown how to establish a good relationship with the students they're tutoring, how to break a task into simple steps, and how and when to give feedback (Fueyo & Bushell, 1998; Graesser et al., 2011; Inglis & Biemiller, 1997; Robinson et al., 2005).
- *Provide a structure for students' interactions.* Providing a structure for tutoring sessions can often help students facilitate their classmates' learning (Fantuzzo et al., 1992; Fuchs et al., 1996; Leung, 2015; Mathes et al., 2001; Spörer & Brunstein, 2009). You might even experience structured peer tutoring in college or graduate school classes (Berghmans et al., 2014). As an example, in one study with elementary school students (Fuchs et al., 1997), higher ability readers were paired with lower ability readers; students then read some material at the level of the weaker reader, and engaged in the following activities:

  - *Partner reading with retell.* The stronger reader read aloud for five minutes, then the weaker reader read the same passage of text. Reading something that a higher-ability peer had previously just read presumably enabled the weaker reader to read the material easily. After the double reading, the weaker reader described the material the pair just read.
  - *Paragraph summary.* The students both read a passage one paragraph at a time. Then, with help from the stronger reader, the weaker reader tried to identify the subject and main idea of the paragraph.
  - *Prediction relay.* Both students read a page of text, and then, with help from the stronger reader, the weaker reader summarized the text and made a prediction about what the next page would say. The students then read the following page, and the weaker reader would confirm or disconfirm the prediction, summarize the new page, and make a new prediction.

This procedure enabled students to make significantly more progress in reading than students who had traditional reading instruction, even though the amount of class time devoted to reading was similar for both groups.

In the middle and secondary school levels, we can incorporate a tutoring component into paired study sessions by teaching students the kinds of questions they might ask one another as they jointly study science, social studies, and other academic disciplines. In one approach (King, 1997, 1999), students are given question "starters" to help them formulate higher-level questions (e.g., "What is the difference between ______and _____?" "What do you think would happen to ______if ______happened?") (King, 1997, p. 230). In the following dialogue, two seventh graders use question starters as they work together to learn more about muscles, a topic that neither of them has previously known much about:

> ***Jon:*** How does the muscular system work, Kyle?
>
> ***Kyle:*** Well... it retracts and contracts when you move.
>
> ***Jon:*** Can you tell me more?... Um, why are muscles important, Kyle?
>
> ***Kyle:*** They are important because if we didn't have them we couldn't move around.
>
> ***Jon:*** But... how do muscles work? Explain it more.
>
> ***Kyle:*** Um, muscles have tendons. Some muscles are called skeletal muscles. They are in the muscles that—like—in your arms—that have tendons that hold your muscles to your bones—to make them move and go back and forth. So you can walk and stuff.
>
> ***Jon:*** Good. All right! How are the skeletal muscles and the cardiac muscles the same?
>
> ***Kyle:*** Well, they're both a muscle. And they're both pretty strong. And they hold things. I don't really think they have much in common.
>
> ***Jon:*** Okay. Why don't you think they have much in common?
>
> ***Kyle:*** Because the smooth muscle is—I mean the skeletal muscle is voluntary and the cardiac muscle is involuntary. Okay, I'll ask now. What do you think would happen if we didn't have smooth muscles?
>
> ***Jon:*** We would have to be chewing harder. And so it would take a long time to digest food. We would have to think about digesting because the smooth muscles—like the intestines and stomach—are *in*voluntary.....
>
> ***Kyle:*** Yeah, well—um—but, do you think it would *hurt* you if you didn't have smooth muscles?
>
> ***Jon:*** Well, yeah—because you wouldn't have muscles to push the food along—in the stomach and intestines—you'd get plugged up! Maybe you'd hafta drink liquid—just liquid stuff. Yuk. (King et al.is, 1998, p. 141)

Notice how the boys ask each other questions that encourage elaboration and metacognitive self-reflection (e.g., "Why don't you think they have much in common?" "Do you think it would hurt you if you didn't have smooth muscles?"). Through such structured interactions, students at the same grade and ability levels can provide valuable scaffolding for one another's learning efforts (King et al., 1998).

- *Be careful that your use of higher-achieving students to tutor lower-achieving students is not excessive or exploitative.* As we've seen, tutors often gain just as much from tutoring sessions as the students they're tutoring. Nevertheless, we mustn't assume that high-achieving students will always learn from a tutoring session. Instead, we should regularly monitor the effects of a peer-tutoring program to make sure that all students are benefiting.
- *Give all students opportunities to tutor other individuals.* This is often easier said than done, as a few students may show consistently lower achievement than their peers. One effective approach is to ask low-achieving students to tutor classmates with disabilities (Cushing & Kennedy, 1997; DuPaul et al., 1998; Fuchs et al., 1997). Another possibility is to teach low-achieving students specific tasks or procedures they can share with their higher-achieving, but in this case uninformed, classmates (Cohen et al., 1976; Webb & Palincsar, 1996). Still another is to have students teach basic skills to younger children (Inglis & Biemiller, 1997). In fact, students with

significant social or behavioral problems (e.g., autism spectrum disorders, emotional and behavioral disorders) can make significant gains in both academic and social skills when they have opportunities to tutor children several years younger than they are (Sullivan & Conoley, 2004).

Nevertheless, we need to be careful to not repeatedly put low achieving students into peer-tutoring scenarios that emphasize their weaknesses in certain academic areas.

Conducting Technology-Based Collaborative Learning Activities

Effective cooperative and collaborative activities don't necessarily have to be face to face. Through such mechanisms as email, chat software, class websites and blogs, learning management systems, electronic bulletin boards, and Zoom, technology enables students to collaborate with their peers (either locally or around the world), exchange perspectives, brainstorm and build on one another's ideas, and occasionally pull experts into the conversation. Collaboration via technology can be very effective, leading to gains in achievement and even to improved ability to communicate with others (Chen et al., 2018). Students must understand, however, that just as there are rules for in-class discussions, there are also rules that apply to electronic discussions. For instance, students must accept that varying perspectives are both welcome and to be expected, and although they can certainly critique others' ideas, they must do so respectfully and without ridicule (Bellanca & Stirling, 2011; Kreijns et al., 2013).

There are two ways of approaching online collaborations. **Synchronous collaboration** occurs when students interact with each other in real time. For example, students might engage in a discussion about a topic of interest using video and audio chat software. **Asynchronous collaboration** occurs when students interact with others, but not in real time. For example, using online bulletin boards or discussion boards, students can engage in meaningful conversations about various topics over a longer period of time. A teacher might ask students to engage in an online discussion regarding their ideas for proposing a neighborhood policy that would impose fines on residents who do not regularly mow their lawns. Using asynchronous communication tools (e.g., a discussion board), students could state their opinions and react to each other's responses over several days or even weeks.

Learning management systems and various web browsers (e.g., Google) provide virtual spaces for students to interact in collaborative groups in an online environment, both synchronously and asynchronously. Students can share information in the form of text, audio, or video to construct a body of shared knowledge about a particular topic. In these electronic environments, students post their work in the form of reports, problem solutions, diagrams, flowcharts, video and audio recordings, short stories, and the like. Their classmates respond regularly, perhaps by giving feedback, building on ideas, offering alternative perspectives, or synthesizing what the group has been learning; sometimes the teacher gets involved in the conversation as well. The electronic nature of interactions gives students the time they may need to reflect on others' ideas and may be especially welcoming for students who are shy or for other reasons feel uncomfortable communicating with peers more publicly. In essence, these platforms provide the foundation for a computer-based *community of learners* in which most students feel comfortable and psychologically "safe" (Hewitt & Scardamalia, 1996, 1998; Lamon et al. 1993; Scardamalia & Bereiter, 2006).

Chapter 9 describes communities of learners in more detail.

One option for technology-based collaborative learning is the GLOBE Program (globe.gov), through which student groups around the world collaborate on inquiry-based projects related to environmental and earth sciences. Students in participating schools and classrooms collect and analyze data about various environmental topics (e.g., climate change, watershed dynamics), write reports, and share their findings with students and professional scientists elsewhere.

As the internet has become increasingly accessible worldwide, then, not only do we have limitless sources of information on which to draw, but we also have limitless mechanisms for communicating and collaborating with other people in faraway settings about issues of common interest. Multinational student–student collaborations are an excellent way to get young learners thinking and acting as *global* citizens as well as citizens of a particular community and country.

Academic Content Domains as Contexts

Learning Objective 13.5 **Apply your knowledge of learning, cognition, and effective instructional practices to various academic content domains.**

Now that we have discussed a variety of psychological processes that affect student learning, it's probably no surprise to you that different subject areas require particular thinking skills. For example, effective reading requires automatic retrieval of the meanings of thousands of words in one's language, whereas mathematical problem solving requires thinking about quantities and flexibly manipulating symbols that represent them. Also, to some degree different domains require somewhat different forms of **literacy**—proficiency with the various concepts and symbols associated with those domains (e.g., mathematical symbols such as ≥ and π, musical notations such as 𝄞 and ♪). Furthermore, various subject areas seem to depend more or less heavily on different parts of the brain (Dehaene, 2007; Katzir & Paré-Blagoev, 2006; Plumert & Spencer, 2007; Posner & Rothbart, 2007).

In a very real sense, then, different content domains are additional *contexts* in which students learn, and strategies for effectively teaching each subject can vary significantly. In upcoming sections, we'll consider four general content domains: language arts, mathematics, science, and social studies. By no means do these topics cover all of the academic curriculum; for example, physical education, music, health, and the visual and performing arts are also disciplines in their own rights and enhance children's development and general well-being in many ways (e.g., Davis, 2008).

Regularly consider how you might integrate two or more content domains in instruction, perhaps in collaboration with other teachers.

In discussing the four domains separately, we authors don't mean to imply that each domain should be consistently taught in isolation from the others. On the contrary, instruction is often more effective when it simultaneously incorporates two or more domains. For example, such **interdisciplinary instruction** might involve teaching reading in conjunction with science or teaching writing in conjunction with history (e.g., Martínez et al., 2008; Monte-Sano, 2008). Furthermore, several general principles of learning apply to *all* domains:

- Learners use the information they receive from various sources to construct their own, unique understandings.
- Learners' interpretations of new information and events are influenced by what they already know and believe about the world.
- With age and development, learners acquire metacognitive strategies and epistemic beliefs that influence their thinking and performance within a domain.
- Learners often gain greater understanding and greater metacognitive sophistication in a domain when they work collaboratively with peers.

Table 13.2 illustrates how each of these principles can be seen in each of the domains we'll consider in this section of the chapter.

COMPARE/CONTRAST

Table 13.2 Applying General Principles of Learning in Different Content Domains

Principle	Language Arts	Mathematics	Science	Social Studies
Constructive processes in learning	Good readers go beyond the information explicitly presented on the page—for example, by drawing inferences and identifying underlying themes.	Beginning with a basic understanding of quantity, numbers, and counting, learners build an increasingly complex and integrated understanding of mathematical concepts.	Learners can better understand and apply scientific ideas when they construct general theories and models that integrate concepts and principles related to particular topics.	Mastery of history, geography, and related domains involves reading maps and historical documents to construct integrated understandings of cause-and-effect relationships among events.
Influence of prior knowledge and beliefs	Learners use what they already know about a topic to help them construct meaning from text.	Mathematics is an especially hierarchical discipline in which many advanced concepts build on ideas learned in earlier years.	Learners often construct their own theories about phenomena before they have formal instruction about these topics. Such theories sometimes interfere with their ability to learn more scientifically acceptable explanations.	Students learn social studies more effectively when they can relate historical events to their own personal experiences.
Metacognitive strategies and epistemic beliefs	Good readers understand that reading involves active meaning making; they monitor their comprehension and engage in processes that are likely to enhance it.	Effective mathematical problem solvers monitor their progress toward problem solutions.	Learners' beliefs about the nature of science influence how they study and learn science; for example, those who believe that science consists of isolated facts are likely to focus on meaningless memorization.	A true understanding of history involves the recognition that a great deal of historical "knowledge" is interpretive rather than factual.
Collaboration with peers	Learners more effectively construct meaning from what they read when they discuss reading material with their classmates.	Learners gain a better understanding of math when they tutor classmates or younger children.	Learners often revise misconceptions about scientific phenomena and acquire more sophisticated scientific reasoning processes when they jointly wrestle with puzzling findings and critique one another's conclusions.	Learners can more effectively practice advanced reasoning skills (e.g., evaluating and integrating information presented in multiple historical documents) when they work in partnership with peers.

Language Arts: Reading and Writing

Children's reading and writing skills build on their knowledge of spoken language. But children must learn the relationships between spoken and written language. They must also master nuances of the written symbol system that have no counterparts in spoken language, such as punctuation marks. Through storybook reading and other activities at home, many children—but not all of them—come to school knowing a few things about written language. For example, they may know that spoken language is represented in a consistent fashion in writing, that reading proceeds from left to right and from the top of the page to the bottom, and that each alphabet letter is associated with particular sounds. They may be able to write part or all of their own name, and they may recognize logos of popular products and commercial establishments, such as Coke and McDonald's. Taken together, such knowledge and skills—collectively known as **emergent literacy**—lay a basic foundation for reading and writing (Gottfried et al., 2015; Serpell et al., 2005). In addition to emergent literacy knowledge and skills, children's ability to learn to read is also affected by other factors. For example, advanced executive functioning and greater general prior knowledge facilitate children's learning to read (Follmer, 2018; Hwang, 2020). And reading and writing, in turn, provide important foundations for learning most other academic disciplines, especially in the middle and secondary school grades (Fox & Alexander, 2011; Goldman et al., 2016; Powell & Hebert, 2016; Rinne et al., 2020).

Teach reading and writing skills across the academic curriculum.

Effective reading and writing strategies tend to take somewhat different forms in different academic disciplines. For example, reading a textbook in a math class is quite different from reading a newspaper article in a social studies class, and writing a short story is quite different from writing a science lab report. As teachers, then, we should teach reading and writing within the context of a variety of content domains—not only in language arts classes but also in math, science, and social studies classes.

The Nature of Skilled Reading Reading is a multifaceted process that involves considerable knowledge and abilities:

- *Sound and letter recognition:* Research indicates that **phonological awareness**—hearing distinct sounds, or *phonemes*, within a spoken word (e.g., detecting the sounds "guh," "ay," and "tuh" in the word *gate*)—is an essential element of successful reading, especially in the beginning stages of learning to read. And, of course, learners must be able to recognize alphabet letters in both uppercase and lowercase forms (Anthony & Francis, 2005; Hulme et al., 2012).
- *Word decoding skills:* Readers inevitably encounter words they don't recognize. In such instances they must draw on letter–sound relationships, familiar prefixes and root words, common spelling patterns, and context clues to decipher the words (Goswami, 2007; Hjetland et al., 2019; Nagy et al., 2006; Rayner et al., 2001).
- *Automatic word recognition:* When learners must use their limited working memory capacity to decode and interpret *many* individual words, they have little or no mental "room" left to use in making meaningful sense of what they're reading. Ultimately, word recognition must become automatic in two ways: Learners must be able to (a) identify most words in a split second, without having to decode them letter by letter; and (b) immediately retrieve the words' meanings (Klauda & Guthrie, 2008; Roembke et al., 2019, 2021; Swanson & O'Connor, 2009).
- *Meaning construction:* Good readers identify main ideas, draw inferences, discover themes, and so on. Sophisticated readers also find symbolism in works of fiction, evaluate the quality of evidence in persuasive essays, and identify assumptions or philosophical perspectives that underlie editorials. Meaning construction can be especially challenging when learners must integrate what they read from two or more distinct texts (Cromley & Azevedo, 2007; Fox & Alexander, 2011; Goldman et al., 2016).
- *Word Order:* Good readers learn quite early that the ordering of words in a sentence matters. For early readers, an understanding of the importance of word order is a particularly important predictor of reading comprehension (Deacon & Kieffer, 2018).
- *Metacognitive oversight:* Good readers metacognitively "supervise" their own reading. For example, they focus attention on parts they deem to be important, and continually self-assess their understanding and memory of what they've read (Bråten et al., 2011; Gaskins et al., 2007; Pressley & Harris, 2006).

It shouldn't surprise you to learn that the amount of knowledge learners already have about a topic enhances their ability to comprehend new material that they read related to that topic (Beck et al., 1991; Britton et al., 1998). Helpful, too, is knowledge about the structures that various types of literature typically follow; for example, the events described in works of fiction often follow a chronological sequence, and persuasive essays usually begin with a main point and then present evidence to support it (Cain et al., 2004; Hebert et al., 2016; Williams et al., 2016).

We must keep in mind that students at any single grade level differ widely in their reading skills; for example, some high school students have poor word decoding skills and little ability to make sense of what they read.

Teach and scaffold reading skills even in the secondary grades.

The Nature of Skilled Writing As you might guess, learners who are better readers also tend to be better writers. This correlation is partly because general language ability—such as knowledge and effective use of vocabulary and various grammatical structures—provides a foundation for both reading and writing. Furthermore, practice in reading promotes vocabulary development and greater awareness of how words are spelled. And regular reading familiarizes learners with common ways in which texts are structured (De La Paz & McCutchen, 2011; Rayner et al., 2001; Shanahan & Tierney, 1990). But effective writing involves additional processes as well:

- *Goal setting:* Good writers determine what they want to accomplish in their writing—perhaps to entertain, describe, report, or persuade—and have a good sense of the audience for whom they're writing (Graham, 2006; Sitko, 1998).
- *Identification and organization of relevant knowledge:* Whether they're writing fiction or nonfiction, good writers identify what they already know about a topic and then, if necessary, supplement it with additional research. Typically, they also spend a fair amount of time organizing their ideas before they write (Benton, 1997; Berninger et al., 1996; Kim et al., 2015).
- *Focus on communication rather than mechanics:* Good writers have typically learned the basic mechanics of writing (handwriting, spelling, punctuation, etc.) to automaticity, thereby leaving "room" in working memory to focus on effectively communicating their intended message (Benton, 1997; Kent & Wanzek, 2016). In their initial drafts, skilled writers focus on conveying their ideas clearly; for example, they begin with what they think readers are likely to know and systematically lead readers toward better understandings. In other words, good writers engage in **knowledge transforming**. In contrast, less-skilled writers engage in **knowledge telling**, writing thoughts in the order in which they retrieve them from long-term memory, with little concern for helping readers understand and learn (Bereiter & Scardamalia, 1987; McCutchen, 1996; Olinghouse et al. 2015).
- *Revision:* Good writers almost invariably revise what they've written, often several times. Although they certainly look for problems related to spelling and grammar, they focus on enhancing organization and clarity (De La Paz & McCutchen, 2011; Fitzgerald, 1992; Harris et al., 2010).
- *Metacognitive regulation of the overall writing effort:* Throughout the writing process, good writers are metacognitively active: They monitor their progress and the effectiveness of what they've written (Hacker et al., 2009; Harris et al., 2010).

The nature and quality of students' writing evolve in many ways throughout the elementary and secondary school years. In the early elementary grades, writing projects typically involve narratives: Students write about their personal experiences and create short, fictional stories. They engage almost exclusively in simple knowledge telling (rather than knowledge transforming), in part because they're still working on basic spelling and grammatical rules (Graham et al., 2007; Hemphill & Snow, 1996; McCutchen, 1996).

In the upper elementary grades, writing mechanics are becoming automatic, enabling students to devote more effort to communicating their thoughts effectively and to thinking about how their readers might respond to what they've written. At this point, however, they do little planning before they begin to write, and their writing continues to involve more knowledge telling than knowledge transforming (Graham, 2006; Owens, 2008).

In the secondary grades, students are better able to analyze and synthesize their thoughts as they write, and thus they're more skillful in writing research papers and argumentative essays. At this point, too, knowledge transforming becomes more common Students also become more metacognitively involved in the writing process, especially when given instruction and guidance in effective metacognitive writing strategies (Graham & Perin, 2007; Harris et al., 2010; Spivey, 1997).

Promoting Reading and Writing Development Explicit instruction in basic reading skills facilitates reading development, especially for poor readers. Under no circumstances should we postpone teaching reading comprehension until basic skills are automatic; to do so would be to communicate the message that reading is a meaningless, tedious task, rather than a source of pleasure and enlightenment (Serpell et al., 2005). Some educators have suggested that virtually all basic literacy skills be taught entirely within the context of reading children's books and other authentic written materials. Such *whole-language* approaches are often quite effective in promoting emergent literacy, such as letter recognition and familiarity with the nature and purposes of books. On the downside, however, letter–sound relationships and phonological awareness are often shortchanged in strictly whole-language instruction. When working with novice readers, then, we probably need to strike a balance between whole-language and basic-skills activities (Claessens et al., 2014; Cummins, 2007; Rayner et al., 2001; Roberts & Meiring, 2006; Sacks & Mergendoller, 1997).

Authenticity is important in writing as well. Students write more frequently, and in a more organized and communicative (i.e., knowledge-transforming) manner, when they can write for a real audience—perhaps their classmates or peers—and when they're interested in their topic (Benton, 1997; Garner, 1998; Graham, 2006). When students learn how to write and have opportunities to write often, their reading skills improve as well (Coker et al., 2018).

Maximize the authenticity of reading and writing tasks, but teach basic skills separately if students might not otherwise master them.

We must remember, too, that skilled reading and writing are both complex activities that involve considerable scaffolding. Following are examples of what we might do:

For Reading

- Remind students of things they already know about a topic.
- Have students meet in pairs to retell or summarize short sections of what they've just read.
- Have students ask one another teacher-like questions about something they've both read (e.g., "Why do you think Alice did that?")
- Provide outlines or graphics that students can use to organize what they're reading.
- Remind students that they should avoid distractions whenever they are reading—they shouldn't be using their phones, having a conversation with someone, or trying to do two things at once while reading.
- Explicitly teach strategies for comparing, contrasting, and evaluating multiple texts that give competing messages. (Alfassi, 2004; Clinton-Lisell, 2021; De La Paz, 2005; Fuchs et al., 1997; Guthrie et al., 2004; Hacker et al., 2009b; Palincsar & Brown, 1984; Spörer & Brunstein, 2009)

For Writing

- Ask students with limited writing skills (especially young children) to dictate rather than write their stories.
- Ask students to set specific goals for their writing, and help them organize their thoughts before beginning to write.
- Help students brainstorm ideas for communicating effectively.
- Provide a structure for students to follow as they write (e.g., for a persuasive essay, ask students to include a main argument, supporting arguments, and rebuttals to possible counterarguments).
- Suggest that children initially focus on communicating clearly and postpone attention to writing mechanics (e.g., spelling, punctuation) until later drafts.
- Provide specific questions that students should ask themselves as they critique their writing (e.g., "Will my readers be able to follow my train of thought?").
- Encourage use of word-processing and voice-recognition software that can support effective writing.

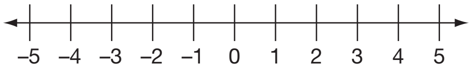
- Have students work in small groups to either (a) critique one another's work or (b) co-write stories and essays. (Benton, 1997; Bouwer et al., 2018; Ferretti et al., 2009; Graham et al., 2020; Graham & Perin, 2007; Harris et al., 2010; Hoogeveen & van Gelderen, 2015; McLane & McNamee, 1990; Quinlan, 2004; Sitko, 1998)

Mathematics

Mathematics includes several subdomains (e.g., arithmetic, algebra, geometry, statistics) that use various methods for representing and solving quantitative problems. Central to all of them are the following:

- *Understanding numbers and counting:* Obviously, learners must know number words (*one, two, three*...), the written symbols that represent them (*1, 2, 3*,...), and their correct sequence. In addition, they must understand that, when counting objects, you must count each object once—and only once—until all objects have been included in the count. Learners eventually construct the mental equivalent of a *number line* on which positive whole numbers and then, later, negative whole numbers are spaced at equidistant intervals (see Figure 13.12). Learners must also become able to mentally approximate where fractions and decimals lie along this mental number line. (Booth & Newton, 2012; Case & Okamoto, 1996; Edwards et al., 2011; Gersten et al., 2015; Göbel et al., 2014; Malone et al., 2020).

Figure 13.12 A genuine understanding of numbers and mathematics requires constructing a mental number line.



- *Understanding central concepts and principles:* For example, learners must master such concepts as *negative number, right angle*, and *variable*, and such principles as "A negative times a negative equals a positive."
- *Mastering problem-solving procedures:* Many of these procedures are specific algorithms that, when correctly applied, always yield an accurate solution. But general problem-solving heuristics (e.g., identifying subgoals, drawing diagrams, rounding complex numbers up or down) often come into play as well. To develop self-efficacy for mathematics, learners can't simply apply such procedures in a rote, meaningless fashion; rather, they must *make sense* of the procedures so that they can use them in appropriate circumstances and experience success while learning new math skills (Baroody et al., 2013; Hecht & Vagi, 2010; Rittle-Johnson et al., 2001).

See Chapter 8 for a more detailed discussion of algorithms and heuristics in problem solving.

- *Encoding problems appropriately:* An essential step in solving a problem is to encode it—to think of it as being a certain *kind* of problem and then represent it with relevant mathematical symbols. For example, a learner might identify one problem as requiring simple addition and another as requiring solving for an unknown variable in a quadratic equation (Fuchs et al., 2004; Geary, 2006).
- *Understanding equivalence:* One of the most essential prerequisites for learning about math is having an understanding of equivalence. Children are often introduced to the "equals sign" (=) early in elementary school. However, it takes a good amount of practice for children to really understand that the quantities that appear on each side of the equals sign are equivalent. It's important to spend time helping children to understand equivalence quite early in elementary school (Matthews & Fuchs, 2020; McNeil et al., 2019).
- *Metacognitive oversight and regulation of problem solving:* For example, a learner must set one or more goals for a problem-solving task, monitor the effectiveness of various problem-solving strategies, and carefully scrutinize final solutions to determine whether they make sense (Carr, 2010; De Corte et al., 2010; Fuchs et al., 2003).

Even as infants, we seem to have a basic ability to think in terms of quantities and relative proportions, but our systematic ways of counting, measuring, and symbolically manipulating quantities are cultural creations that not all cultural groups share (Halford & Andrews, 2006; McCrink & Wynn, 2007; Saxe & Esmonde, 2005).

When children are regularly exposed to numbers and counting, many of them come to school knowing how to count—at least to 10, and often well beyond (Ginsburg et al. 2006; Susperreguy et al., 2020). They may also have simple, self-constructed procedures for adding and subtracting small quantities of objects—for instance, by putting up a certain number of fingers and then either adding or subtracting fingers as necessary (Siegler & Jenkins, 1989). Generally, however, more sophisticated mathematical knowledge and skills come from formal instruction, especially at school. Children who have been introduced to some math instruction during a preschool program may have a somewhat easier time learning math during the early elementary grades (Watts et al., 2018).

Despite ongoing math instruction throughout the elementary and secondary grades, many students seem to have particular difficulty with mathematics as a content domain. These difficulties often lead to feelings of anxiety, which can have a detrimental effect on learning about mathematics (Tomasetto et al., 2021). To some degree, their difficulty may lie in their limited ability to think about proportions (e.g., fractions, ratios) and abstract concepts removed from everyday reality (e.g., *pi, infinity*) (Siegler et al., 2012; Siegler & Lortie-Forgues, 2017). Encoding problems mathematically can pose an additional challenge, especially if students have learned concepts and procedures only in a rote, meaningless manner (Carr, 2010; Geary, 2006). The limited use of real-world math problems in math textbooks and workbooks may negatively affect students' cognitive and emotional engagement during math instruction (Matthews, 2018; Schmidt et al., 2022). Unfortunately, too, many elementary and secondary school students don't metacognitively reflect on what they're doing as they work on mathematical problems (Carr, 2010; Roditi & Steinberg, 2007). To see how metacognitively reflective *you* are when you do math problems, try the next exercise.

Experiencing Firsthand

Busing the Band

Take a few seconds to solve this problem. Feel free to use a calculator if you have one handy.

> The Riverdale High School marching band is traveling to Hillside High School to perform in the half-time show at Saturday's football game. The school buses owned by the Riverdale School District can transport 32 passengers each. There are 104 students in the Riverdale band. How many buses will the band director need in order to transport the band to Hillside on Saturday?

Is your answer 3.25? If so, think about that for a moment. How is it possible to have 3.25 *buses*? The band director must actually request 4 buses for Saturday's game. If you fell into our trap, you're not alone. Many students develop the habit of solving word problems based on the numbers alone, and overlook the realities with which they're dealing (De Corte et al., 1996).

Compounding the issue is that students are apt to have fairly naive epistemic beliefs about the nature of mathematics. The following misconceptions are common:

- Mathematics is a collection of meaningless procedures that must simply be memorized and recalled as needed.
- Math problems always have one and only one right answer.
- There's only one correct way to solve any particular math problem.
- Some people are naturally good at math, whereas others are not. (De Corte et al., 2010; Muis, 2004; Richland et al., 2012; Schoenfeld, 1988, 1992)

Promoting Learning in Mathematics Unfortunately, many students focus largely on rote memorization of concepts and procedures when they study math (Carr, 2010; De Corte et al., 2010). Following are general strategies for promoting more meaningful learning and conceptual understanding:

- When formally introducing addition and subtraction, encourage students to use effective strategies they've already constructed on their own (e.g., counting on fingers), but also foster gradual automaticity for addition and subtraction facts.
- Use a number line to help students understand how whole numbers and fractions relate to one another.
- Combine problems requiring different strategies (e.g., subtraction, multiplication) into a single practice set.
- Present problems that include irrelevant as well as relevant information.
- Present complex, real-world problems with multiple possible answers; have students work on them in small groups and explain their reasoning to one another.
- Encourage students to use calculators and spreadsheets to assist them in solving problems, especially after they've mastered the basic skills and procedures they're now offloading onto technology (e.g., adding a lengthy set of numbers).
- Present worked-out examples to illustrate multistep problem-solving procedures (e.g., solving for x in an algebraic equation).
- Teach and scaffold effective metacognitive processes (e.g., have students ask themselves such questions as "Does this solution make sense?"). (Carbonneau et al., 2013; M. Carr, 2010; Clarke et al., 2010; De Corte et al., 2010; Fuchs, Fuchs, et al., 2008; Geary, 2006; Griffin & Case, 1996; Lampert et al., 1996; Renkl & Atkinson, 2010; Rittle-Johnson, 2006; Rittle-Johnson & Star, 2009; Roditi & Steinberg, 2007; Rohrer & Pashler, 2010; Sarama & Clements, 2009)

Science

As a discipline, science has two major goals: to describe and explain what people observe in nature. Also central is the *scientific method*, which includes a number of more specific cognitive processes with a common element: a conscious intention to both acquire and evaluate new knowledge and explanations.

Key to scientific reasoning are the following:

- *Hypothesis formation and testing:* Scientists begin with tentative conjectures—*hypotheses*—about the nature of the world, its inhabitants, and the broader universe. Then, to the extent that they can, they systematically test their hypotheses by separating and controlling variables that might possibly influence other variables.
- *Careful, objective documentation of observations:* Scientists keep careful records of their observations. Ideally, they categorize and measure the things they observe in consistent, objective ways.
- *Construction of theories and models:* Scientific inquiry is a very constructive process. Often it involves constructing **theories**—organized bodies of concepts and principles intended to explain certain phenomena. It may also involve constructing **models**—physical or symbolic representations that show how certain entities might be interrelated parts of a larger system. For example, you've probably seen three-dimensional physical models of the sun and planets in our solar system, and you've undoubtedly seen graphic models of various phenomena in textbooks.
- *Metacognitive reflection:* Good scientists think not only about the nature of things but also about the nature of *their thinking* about things. For example, they continually ask themselves whether they're being objective in their observations, and whether their evidence adequately supports their hypotheses and conclusions.

- *Advanced epistemic beliefs about the nature of scientific knowledge:* Good scientists understand that theories and models are, at best, incomplete and potentially flawed constructions of reality and that, more generally, scientific understandings must continue to change and evolve as new evidence comes in (Kuhn, 2009; Lombardi et al., 2016; Rosengren et al., 2012).
- *Conceptual change when warranted:* Good scientists continually revise their beliefs and understandings as credible new evidence and theories appear on the scene. In general, they keep open minds about the nature of phenomena and cause-and-effect relationships.

Children begin to construct theories about their physical and biological worlds long before they reach school age, but these early, self-constructed theories don't necessarily jibe with contemporary scientific thinking (Goldberg & Thompson-Schill, 2009; Vosniadou, 2008). For example, consider 7-year-old Rob's theory about mountain formation:

See Chapter 7 for more detailed information on children's early theories and common misconceptions.

Adult: How were the mountains made?

Rob: Some dirt was taken from outside and it was put on the mountain and then mountains were made with it.

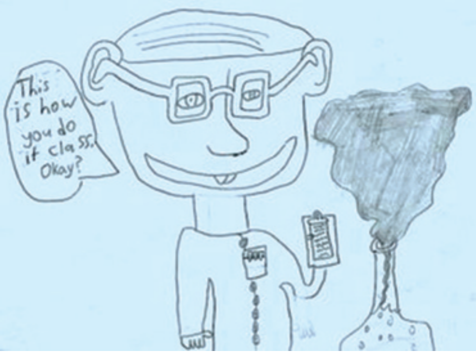
Adult: Who did that?

Rob: It takes a lot of men to make mountains, there must have been at least four. They gave them the dirt and then they [the mountains] made themselves all alone.

Adult: But if they wanted to make another mountain?

Rob: They pull one mountain down and then they could make a prettier one. (Piaget, 1929, p. 348)

Sometimes children's early theories are the results of their day-to-day observations; for example, Rob has probably observed construction workers moving dirt around. In other instances, children's theories emerge from explicit teachings or more implicit worldviews of their cultures. Children rarely come to school as "blank slates" when it comes to science. With formal instruction and informal learning experiences, their scientific knowledge gradually aligns itself with that of the adult scientific community, but misconceptions persist, especially when scientists' explanations are exceptionally abstract or seemingly conflict with children's personal experiences or cultural worldviews.


This is how you do it class. Okay?

In this pencil drawing, 9-year-old Corey portrays his science lab as one in which his teacher prescribes particular steps to follow. Ultimately, however, Corey must come to understand the true *nature* of science—that it comprises an integrated set of concepts, theories, strategies, and other cognitive tools for systematically investigating and explaining the physical, biological, and social worlds in which we live.

Children's scientific reasoning abilities change with age, experience, and formal instruction. For example, elementary school students can often distinguish between experiments that do and don't adequately control variables, yet they're apt to have trouble controlling variables in their *own* experiments—a task that requires them to keep track of several things simultaneously and thus may tax their limited working memory capacity (Bullock & Ziegler, 1999; Metz, 2004, 2011). Middle school and high school students are better able to separate and control variables than elementary school children, but even they occasionally have trouble doing so. Furthermore, in their hypothesis testing, they tend to focus on and test hypotheses they think are correct and to ignore evidence that contradicts their hypotheses or for some other reason strikes them as implausible. Such *try-to-prove-what-I-already-believe* thinking is known as **confirmation bias**.

As you might guess, students' metacognitive sophistication in scientific thinking also improves with age and instruction (Kuhn, 2009; Kuhn & Franklin, 2006; Sandoval et al., 2014). At the same time, good scientific thinkers understand that defensible theories aren't fly-by-night speculations that have come out of thin air—that, instead, they're based on substantial bodies of evidence (Chinn & Buckland, 2012; Sandoval et al., 2014).

Promoting Learning in Science Certainly, science instruction should introduce students to the many fundamental concepts, principles, and theories that various scientific disciplines have constructed to explain everyday experiences—for instance, why people get sick, why water expands when it freezes, and why (thanks to a solar eclipse) the sky might suddenly turn dark in the middle of the day. In addition, we must attune students to the dynamic, ever-changing nature of science and foster the reasoning skills that will enable them both to draw appropriate conclusions from others' research findings and to conduct research studies themselves. Educated individuals understand that science isn't undisputed fact—that, instead, it simply reflects society's best efforts to make sense of the world—and that almost anyone can make significant contributions to humankind's collective knowledge base.

The Into the Classroom feature "Promoting Mathematical and Scientific Reasoning Skills" presents several general strategies useful in both math and science instruction. Following are additional strategies that researchers have found to be effective in teaching science.

- Ask students to explain their current beliefs and theories about a phenomenon; listen carefully both for elements of truth on which you can build and for unproductive misconceptions that require revision.
- Illustrate relationships among concepts and principles using live demonstrations, physical models, paper-and-pencil diagrams, or computer simulations, being careful not to induce cognitive overload by providing too much information for students to process at once.
- Present phenomena that are inconsistent with students' current understandings—for example, by showing how a wool blanket (something students associate with warmth) can actually help keep a cold drink cool.
- Have students design and carry out experiments to test various hypotheses about cause-and-effect relationships.
- When experiments with real-world objects and events are impractical or impossible, have students test their hypotheses in computer-simulated environments.
- Scaffold students' efforts to separate and control variables and to draw appropriate conclusions. For example, ask questions that focus their attention on critical aspects of what they're observing and nudge their thinking in appropriate directions.
- Engage students in small-group or whole-class discussions in which they propose and try to justify various explanations for empirical findings.
- Explicitly draw students' attention to results that contradict their predictions and expectations; ask students to explain and in other ways make sense of those results. (Chinn & Buckland, 2012; Clark, 2006; Clement, 2008; Coleman et al., 2018; Eberbach & Crowley, 2009; Furtak et al., 2012; Kontra et al., 2015; M. C. Linn & Eylon, 2011; Lorch et al., 2014; Sandoval et al., 2014; Siler & Klahr, 2016; Snir et al., 2003; Wright & Gotwals, 2017)

Social Studies

The term *social studies* encompasses content domains concerned with the nature of human societies and social relationships, both past and present. Our focus here will be on two domains that are especially prominent in elementary and secondary school curricula: history and geography.

The Nature of Historical Knowledge and Thinking At its core, history is very much a socioculturally transmitted body of knowledge. Furthermore, different cultural groups are likely to put their own spins on history, portraying past events in ways that are consistent with their beliefs and worldviews. For example, in the United States, European American students tend to view U.S. history as being guided by principles of freedom and democracy, whereas African American students are more likely to view it as being marked by racism and violations of basic human rights (Epstein, 2000; Epstein & Shiller, 2009). Such diverse interpretations are almost certainly the result of how various people and media in one's cultural group and larger society have described historical events (Hughes, Bigler, & Levy, 2007; Levstik, 2011).

A solid mastery of history, both as a body of knowledge and as an academic discipline, requires several abilities and processes:

- *Comprehending the nature of historical time:* Constructing legitimate understandings of history requires an abstract comprehension of the lengthy time span across which human events may have occurred—a time span far beyond any individual's personal experience.

- *Perspective taking:* Truly making sense of history requires recognizing that even highly influential and respected people (e.g., George Washington, Winston Churchill) weren't perfect: They had their own foibles and fallibilities, and they made mistakes. Furthermore, historical figures lived in particular cultural and social contexts that profoundly influenced their thoughts and actions. Good historians try to put

Into the Classroom

Promoting Mathematical and Scientific Reasoning Skills

- **Take students' general cognitive development into account when teaching concepts and principles.**

  A fourth-grade teacher asks students to conduct experiments to find out what conditions influence the growth of sunflower seeds. He knows that his students probably have only a limited ability to separate and control variables, so he asks them to study the effects of just two things: the amount of water and the kind of soil. He has the students keep their growing plants on a shelf by the window, where temperature and amount of sunlight will be the same for all the plants.

- **Use concrete manipulatives, analogies, and computer simulations to illustrate abstract ideas.**

  A high school physics teacher has learned from experience that even though her students are, in theory, capable of abstract thought, they're still likely to have trouble understanding this principle: *When an object rests on a surface, the object exerts a force on the surface, and the surface also exerts a force on the object*. To illustrate the principle, she places a book on a large spring. The book compresses the spring somewhat, but not completely. "So you see, class," she says, "the book pushes down on the spring, and the spring pushes up on the book. An object compresses even a table or other hard surface on which it rests—not so much that you'd notice—and the surface pushes back in response."

- **Ask students to apply math and science to real-world problems.**

  With the help of a local scientist, a fifth-grade class conducts a study of its town's drinking water, taking small samples from various sources, examining the contents under a microscope, tabulating the results, and comparing its findings to recommended safety standards.

- **Pose problems that are relevant to students' local environments and cultures.**

  In an inner-city neighborhood where colorful street art is highly valued, a high school math teacher gives small cooperative groups the following problem:

  > Your sister loves street art. You would like to recreate one of her favorite pieces for her birthday. You decide to create a poster board replica of this piece even though you're not an artist. Suddenly a deeper side of the image strikes you.
  >
  > This is going to be easy! You notice the tip of his nose at $(0, 0)$ the bottom lip $(0, -2)$ . . . Where is his right eye, . . . the bottom of his chin, . . . the large patch of grass? What is the domain and range? Explain your reasoning. Try creating a replica on poster board.

- **Ask students to identify several strategies or hypotheses regarding a particular task or problem and to explain and justify their ideas to one another.**

  A middle school math teacher is beginning a unit on how to divide numbers by fractions. After students convene in small groups, she says, "You've already learned how to multiply one fraction by another. For example, you've learned that when you multiply $\frac{1}{3}$ by $\frac{1}{2}$ you get $\frac{1}{6}$. But now imagine that you want to *divide* $\frac{1}{3}$ by $\frac{1}{2}$. Do you think you'll get a number smaller than $\frac{1}{3}$ or larger than $\frac{1}{3}$? And what kind of number might you get? Discuss these questions within your groups. In a few minutes we'll all get back together to talk about the ideas you've come up with."

- **Foster metacognitive strategies that students can use to regulate their experimentation and problem solving.**

  When a high school science teacher has students conduct lab experiments, he always asks them to keep three questions in mind as they work: (a) *As I test the effects of one variable, am I controlling for possible effects of other variables?* (b) *Am I seeing anything that supports my hypothesis?* and (c) *Am I seeing anything that contradicts my hypothesis?*

- **Have students use mathematics and scientific methods in other content domains.**

  A junior high school social studies teacher asks students to work in small groups to conduct experiments regarding the effects of smiling on other people's behavior. As the groups design their experiments, he reminds them about the importance of separating and controlling variables, and he insists that each group identify an objective means of measuring the specific behavior or behaviors that it intends to study. Later, he has the groups tabulate their results and report their findings to the rest of the class.

SOURCES: Brown & Clement, 1989 (book-on-spring example); Carr, 2010; De Corte et al., 2010; Kuhn & Dean, 2005; Lampert et al., 1996; Lehrer & Schauble, 2006; Linn & Eylon, 2011; Matthews et al., 2013, p. 136 (street art example); Metz, 2011; Morra et al., 2008; Sandoval et al., 2014; Sarama & Clements, 2009; Snir, Smith, & Raz, 2003.

---

themselves in historical figures' shoes—to perceive events as those individuals might reasonably have perceived them (Lee & Ashby, 2001).

- *Drawing inferences from historical documents:* History textbooks often describe historical events in a matter-of-fact manner, communicating the message that "This is what happened." In reality, however, historians often don't know exactly how particular events unfolded. Instead, they construct reasonable interpretations of events after looking at a variety of historical documents that might offer conflicting accounts of what transpired (Goldman et al., 2016; Summerlin, 2015; vanSledright & Limón, 2006).
- *Identifying possible cause-and-effect relationships among events:* Mastery of history includes not only knowledge and interpretations of events but also a sense of how some events—perhaps certain political decisions, religious movements, or economic downturns—may have directly or indirectly led to *other* events (van Drie et al., 2006).
- *Evaluating the credibility of various documents and interpretations:* Some historical documents are reasonably objective and accurate accounts of historical events and trends; government census records from past decades are an example. But many other documents—newspaper articles, personal letters and diaries, and the like—reflect the opinions and biases of their authors. Competent historians take such biases into account when drawing their conclusions about events, but they also understand—metacognitively—that their own and others' interpretations aren't necessarily the best or only ones (Goldman et al., 2016; Summerlin, 2015; vanSledright & Limón, 2006; Wissinger et al., 2021).

Such abilities and processes require a fair amount of abstract thinking, and so learners acquire them only gradually over the course of development. For instance, in the early elementary grades, children tend to have little understanding of historical time and of the complexity of historical changes (Barton & Levstik, 1996; Ormrod et al., 1999). They might refer to events that happened "a long, long time ago" or "in the old days" but have virtually no conception of the time span in question.

Other abstract notions continue to challenge students even in adolescence. Many high school students struggle with the ideas that history involves perspectives as well as facts and that historical figures may have been influenced by social and cultural factors very different from their own. Without explicit instruction and guidance, they're apt to have trouble effectively reconciling conflicting data that various historical accounts yield (Levstik, 2011; Nokes et al., 2007; Stahl & Shanahan, 2004).

The Nature of Geographic Knowledge and Thinking The discipline of geography is concerned not only with where various natural features and cultural groups are located but also with why and how they got there. For example, geographers study how rivers and mountain ranges end up where they do, why people are more likely to settle in some locations than in others, and how people in various locations make their livings and interact with one another.

The following abilities are key elements of knowledge and thinking in geography:

- *Understanding maps as symbolic representations:* An essential cognitive tool in geography is, of course, the *map*. Learners must understand that maps symbolically depict spatial relationships among various physical and/or human-made features in a given geographic area. They must also understand that different maps are drawn to different scales, reflecting various ratios between graphic representations and reality.
- *Identifying interrelationships among people and their environments:* For example, skilled geographers recognize that people tend to migrate from places with limited or decreasing resources to places with more plentiful resources. And people are more likely to settle in areas that are easily accessible by water or land—perhaps those along navigable rivers or near major roadways.
- *Acknowledging cultural differences and their implications for human behavior patterns:* Geographers are acutely aware of how cultural beliefs and practices can have widespread influences on people's behavior. For example, a group's beliefs about forbidden foods can put limitations on the crops and livestock being raised. In some instances, the Chinese concept of *feng shui* directs some individuals to locate and orient buildings in ways that effectively align with certain spiritual forces.

Children's facility in interpreting and using maps depends in part on the sociocultural context in which they've been raised. Maps are commonplace in some cultures, nonexistent in others. Even in a society that uses maps extensively, children have varying degrees of experience with geography and maps. For instance, children whose families travel quite a bit tend to have greater appreciation of distance, more familiarity with diverse landscapes, and a better understanding of how maps are used (Liben & Myers, 2007; Trawick-Smith, 2003).

When children in the early elementary grades look at large-scale maps—perhaps those depicting a state or country—they tend to take what they see somewhat literally. For example, they may think that lines separating states and countries are actually painted on the Earth, or that an airport denoted by a picture of an airplane has only one plane. Young children also have trouble maintaining a sense of scale and proportion when interpreting maps. For example, they might deny that a road could actually be a road because "it's not fat enough for two cars to go on," or insist that a mountain depicted on a three-dimensional relief map can't possibly be a mountain because "it's not high enough" (Liben & Myers, 2007, p. 202). As children get older, and especially as they reach adolescence, they become more proficient in dealing with the symbolic and proportional nature of maps (Forbes et al., 1999; Liben & Myers, 2007; Myers & Liben, 2008).

Despite their growing proficiency with maps, children and adolescents alike tend to have somewhat narrow epistemic beliefs about geography as a discipline. Typically, they conceive of geography as being little more than the names and locations of various countries, capital cities, rivers, mountain ranges, and so on—perhaps, in part, because teachers often present geography this way (Bochenhauer, 1990; Peck & Herriot, 2015; vanSledright & Limón, 2006). Even in the high school years, students rarely reflect on (a) why various locations on Earth might have distinctly different physical features (e.g., mountains, dry grasslands, wetlands) or (b) how the economic and cultural practices of various social groups might be partly the result of the groups' specific physical environments.

Promoting Learning in Social Studies The Into the Classroom feature "Enhancing Learning in History and Geography" presents several general strategies for teaching these two disciplines. Following are more specific instructional strategies to keep in mind:

For History

- In the early elementary grades, focus instruction on students' own personal histories and on events that have occurred locally and in the recent past.
- Beginning in the upper elementary grades, introduce students to primary historical sources, such as diaries, letters, and newspaper articles.

Into the Classroom

Enhancing Learning in History and Geography

- **Help students organize and integrate the things they are learning.**

  During a unit on ancient civilizations (e.g., Mesopotamia, Egypt, Greece, Rome), a middle school social studies teacher has students mark the location of each civilization on a map of the Eastern Hemisphere. She also has them develop a timeline that depicts the rise and fall of various civilizations.

- **Ask students to draw inferences from maps and historical documents and to support their inferences with evidence.**

  A high school geography teacher displays a map showing European countries and their capital cities. "Notice how almost all of the capital cities are located either by seaports or on major rivers," he points out. "Why do you suppose that is?"

- **Identify cause-and-effect relationships.**

  A high school history teacher asks students to consider the questions, "Why was Pearl Harbor such an important location to control?" and "What effects did the Japanese bombing of Pearl Harbor have on the course and final outcome of World War II?"

- **Encourage empathy for people from diverse cultures and different time periods.**

  A third-grade teacher encourages students to imagine themselves as Native Americans who are seeing Europeans for the first time. "You see some strange-looking men sail to shore on big boats—boats much larger than the canoes your own people use. As the men get out of their boats and approach your village, you see that they have very light skin; in fact, it's almost white. Furthermore, some of them have yellow hair and blue eyes. 'Strange colors for hair and eyes,' you think to yourself. How might you feel as these people approach you?"

- **Scaffold productive metacognitive processes.**

  An eighth-grade history teacher has students read several historical documents related to European Americans' westward expansion in North America during the 1800s. The teacher gives students some questions to consider as they read and compare the documents—for example, "What was each author's purpose?" "Do you find evidence of bias?" "Is an event described differently in different documents?"

- **Have students tackle challenging tasks in pairs or small groups.**

  Students in an advanced high school history class work in pairs to (1) read multiple documents related to a historical event and then (2) write an essay evaluating the trustworthiness of the documents and defending a particular narrative about the event itself.

SOURCES: Brophy et al., 2009; W. G. Cole, 2015; Davison, 2011; De La Paz, 2005, p. 145 (westward expansion example); Enyedy, 2005; Goldman et al., 2016; M. Gregg & Leinhardt, 1994; Liben & Downs, 1989a; Nokes et al., 2007; van Drie et al., 2006.

- In the middle school and secondary grades, have students read multiple accounts of significant historical events and then draw conclusions about both what *definitely* happened and what *might* have happened.
- Role-play scenarios and decision-making processes that might have occurred during critical times (e.g., have students take on the roles of American colonists and British soldiers in the years prior to the American Revolution).
- Have students write fictional journal entries or short stories from the perspective of a particular time period or historical figure.
- Ask students to consider how things might have been different if certain events had *not* taken place. (Brophy & Alleman, 1996; Brophy et al., 2009; Byrnes, 1996; Leinhardt et al., 1994; Turner et al., 2015)

Figure 3.5 in Chapter 3 presents a student's fictional journal entries written from the perspective of a slave owner in the pre–Civil War United States.

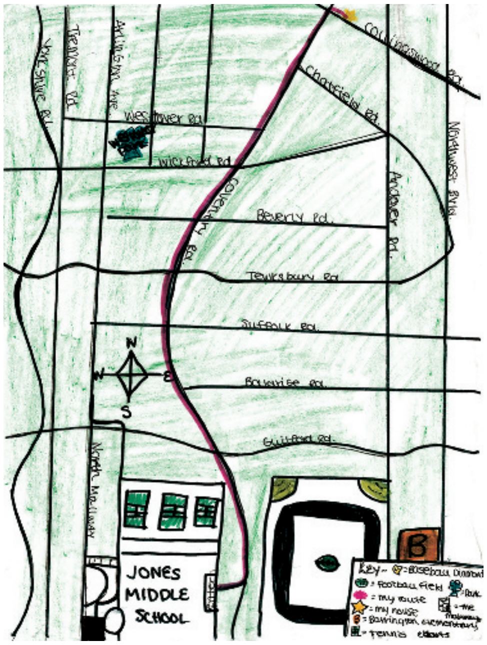
For Geography

- Have students create maps of their school building or local neighborhood (e.g., see Figure 13.13).
- Provide explicit instruction in common map symbols (e.g., compass rose, special dots designating capital cities, contour lines depicting elevation).
- In the upper elementary or middle school grades, introduce the concept of *scale* in maps (e.g., 1 inch per mile, 1 centimeter per 10 kilometers).
- Emphasize the complex, dynamic interrelationships among the Earth's physical features and human activity (e.g., why towns and roads were constructed in particular locations).
- Arrange for internet-based conversations with members of diverse cultural groups around the globe (e.g., with Palestinians who live in Gaza City, or with members of the African National Congress political party in South Africa).
- Teach students how to use age-appropriate mapping websites and software (e.g., Google Earth). (Brophy et al., 2009; Carano, 2015; Enyedy, 2005; Gersmehl, 2014; Liben & Downs, 1989a, 1989b)

For Social Studies in General

- Focus on key principles—*big ideas*—that underlie social studies (e.g., basic human needs and motives, adaptation, interdependence, globalization).
- Relate concepts and principles to students' everyday experiences.
- Avoid characterizing individuals and groups as simplistic, one-dimensional figures, and vigorously combat stereotypes of any particular group in history or the modern-day world.
- Assign works of fiction that realistically depict people living in particular times and places.
- Engage students in authentic activities related to what they're learning (e.g., creating a museum display, analyzing political attack ads on television). (Brayboy & Searle, 2007; Brophy et al., 2009; McDevitt & Kiousis, 2006; NCSS, 2010; Turner et al., 2015)

Figure 13.13 Twelve-year-old Mary Lynn constructed this local map for an assignment in her social studies class.



Julie Peters

Considering Group Differences

Students' cultural and ethnic backgrounds can have implications for our choice of instructional strategies. For instance, students from cultures that place a high premium on interpersonal cooperation (e.g., as is true in many Black, Hispanic/Latino/a and Native American communities) are apt to achieve at higher levels in classrooms with many interactive and collaborative activities (Castagno & Brayboy, 2008; García, 1994, 1995; Gray et al., 2020; Webb & Palincsar, 1996). In contrast, recent immigrants from some Asian countries may be more accustomed to teacher-directed instruction than to learner-directed classroom activities, and students who have only limited

Identify teaching strategies that are compatible with students' cultural backgrounds.

proficiency in English may be reluctant to speak up in class discussions (Walshaw & Anthony, 2008). When working with English language learners, technology can often come to our assistance, perhaps in the form of bilingual software for teaching basic skills, English-language tutorials, and word processing programs with spell checkers and grammar checkers (Egbert, 2009; Merrill et al., 1996).

We must take gender differences into account as well. For example, video games that engage students in simulated real-world problems can often captivate boys who aren't otherwise motivated to master academic skills (Carr-Chellman, 2012). Meanwhile, although some boys thrive on competition, girls often tend to do better when instructional activities are interactive and cooperative. However, there is research that suggests that some girls can be intimidated by whole-class discussions; they're more likely to participate when discussions and activities take place in small groups (Théberge, 1994). Because boys sometimes take charge of small-group activities, we may occasionally want to form all-female groups. Such practices may be particularly helpful in math instruction, since girls often report being less intrinsically motivated and having poorer attitudes toward math than boys do (Frenzel et al., 2010; Levine & Pantoja, 2021). By doing so, we're likely to increase girls' participation in group activities and to encourage them to take leadership roles (Fennema, 1987; Slavin et al., 2003).

Use cooperative approaches to enhance the achievement of females and of students whose cultural groups especially value cooperation.

Our choice of instructional strategies can be especially critical when we work in schools in low-income, inner-city neighborhoods. Students in such schools often get a lot of drill-and-practice work in basic skills—work that's hardly conducive to fostering excitement about academic subject matter (Ferguson, 1998; Levin, 2007; Pianta & Hamre, 2009; Portes, 1996). Mastering basic information and skills is essential, to be sure, but we can frequently incorporate them into authentic activities and computer-based simulations and games in which students apply what they're learning to personal interests and real-world contexts (Eccles, 2007; Squire, 2011). For example, when studying elections, depending on the grade level, students might conduct their own mock elections, analyze candidates' attacks on opponents, or give speeches about particular propositions on a ballot. Students who study the electoral process using authentic activities of this nature may subsequently be more likely to learn more about and discuss the elections with others (McDevitt & Chaffee, 1998), probably because they have developed positive achievement values (Wigfield & Eccles, 2000).

Use well-designed electronic simulations when hands-on activities are impractical or impossible.

Interactive and collaborative strategies are particularly valuable when our instructional goals include promoting social development as well as academic achievement. As we've seen, interactive approaches such as cooperative learning and peer tutoring encourage friendly relationships across ethnic groups. Furthermore, collaborative activities—especially when they require multiple skills and abilities—can foster an appreciation for the various talents that students with diverse backgrounds can contribute (Cohen, 1994; Cohen & Lotan, 1995).

Address any missing emergent literacy skills within the context of engaging activities, such as alphabet games and high-interest storybook reading. Encourage students to write in their native dialect in appropriate contexts, such as in poems and short stories.

Chapter 4 describes the nature of dialects and Standard English; it also summarizes research regarding gender differences in various content domains.

As we teach reading and writing, we must remember that students will have had varying experiences with written language at home. For example, the lives of some students may have been filled with storybooks and bedtime reading, whereas the lives of others may have involved more oral storytelling. Especially in the primary grades, then, we must not assume that children have mastered alphabet letters and other basics of written language. In addition, some children's families speak a language other than English at home, and other children's families speak a dialect of English quite different from the Standard English that is typically used in classrooms. Effective reading and writing instruction takes such backgrounds into account (Janzen, 2008; Klingner & Vaughn, 2004; Serpell et al., 2005).

Group Differences and Specific Subject Areas When teaching math and science, we must keep in mind that these two disciplines have, historically, been considered largely "male" domains (Miller et al., 2018). Even in this 21st century, the boys in our classes are, on average, more likely to believe they can be successful in these areas; this tends to be the case even though there are no substantial gender differences in *ability* in math and science (Herbert & Stipek, 2005; Hübner et al., 2017; Leaper & Friedman, 2007). We must regularly convey the message that both content domains are important for girls as well as for boys. We should also use instructional strategies that encourage students of all genders to become actively involved in talking about, applying, and mastering math and science; for instance, such strategies might involve hands-on activities and small-group discussions.

Traditionally, too, females have been given short shrift in history—as have most minority groups—in the sense that history textbooks in mainstream Western culture tend to focus largely on the activities and accomplishments of European American males (Berkin et al., 2009; Levstik, 2011). Accordingly, we may often need to supplement texts with materials that paint a more inclusive picture of our multicultural heritage. Furthermore, we must remember that students' meaning-making in social studies will, in part, be a function of the cultures in which they've been raised and the early family experiences they've had. For example, students with Japanese ancestry are likely to have a very different perspective on President Harry Truman's decision to bomb Hiroshima in 1945 than will students with European ancestry. Some students have had little or no experience with diverse cultural environments and far-away places. A friend of one of the authors once took students from a lower-income, inner-city Denver neighborhood on a field trip to the Rocky Mountains. Even though these children had often seen the Rockies in the distance from downtown Denver, on seeing them up close for the first time, some of them were amazed at how big they were. And a few of them were surprised to discover that the white stuff on the mountaintops was snow!

Take extra steps to motivate and encourage females to achieve in math and science, and include the important roles of women and ethnically and religiously diverse groups in history lessons.

Remember that students' differing cultural backgrounds and early experiences may influence their thinking about both history and geography.

Accommodating Students with Special Needs

We must often modify our instructional goals and strategies for students who have exceptional cognitive abilities or disabilities—an example of the *differentiated instruction* mentioned early in the chapter. For example, to ensure that all students are working on tasks appropriate for their current skill levels (i.e., tasks within each student's zone of proximal development), we may need to identify more basic instructional goals for some students (e.g., those with intellectual disabilities) and more challenging goals for others (e.g., those who are gifted). In addition, different instructional strategies may be more or less useful for students with varying special needs. For instance, strictly expository instruction (e.g., a lecture or textbook chapter) can provide a quick and efficient means of presenting new ideas to students who process information quickly and abstractly but might be incomprehensible and overwhelming to students with low cognitive ability. Similarly, inquiry learning and discussion-based approaches are often effective in enhancing the academic achievement of students with high ability but may be detrimental to the achievement of students with lower ability who haven't yet mastered basic concepts and skills (Corno & Snow, 1986; Lorch et al., 2010). In contrast, mastery learning and direct instruction have been shown to be effective with students who have learning difficulties, but these approaches might prevent rapid learners from progressing at a rate commensurate with their potential (Arlin, 1984; Rosenshine & Stevens, 1986; Stein & Krishnan, 2007). Table 13.3 identifies some characteristics of students with special needs that might influence instructional decision making.

Include your instructional strategies in the individualized education programs (IEPs) you develop for students with special needs.

Accommodating Students with Special Needs in Specific Subject Areas Many students with special needs have difficulties with reading and writing. The majority of poor readers—whether they've been identified as having a learning disability, attention-deficit hyperactivity disorder (ADHD), or some other disability—appear to have a significant deficit in phonological awareness: They have trouble hearing the individual sounds in words and connecting those sounds with letters. A few poor

STUDENTS IN INCLUSIVE SETTINGS

Table 13.3 Identifying Appropriate Instructional Goals and Strategies for Students with Special Educational Needs

Category	Characteristics You Might Observe	Suggested Strategies
Students with specific cognitive or academic difficulties	• Uneven patterns of achievement • Difficulty with complex cognitive tasks in some content domains • Difficulty processing or remembering information presented in particular modalities • Poor listening skills, reading skills, or both • Greater-than-average difficulty in completing homework assignments	• Tailor goals to individual students' strengths and weaknesses. • Identify the specific cognitive skills involved in a complex task; consider teaching each skill separately. • Use direct instruction, mastery learning, computer-based instruction, cooperative learning, and peer tutoring to help students master basic knowledge and skills. • Provide information through multiple modalities (e.g., videos, audio recordings, graphic materials); also provide advance organizers and study guides. • Have students use computer tools (e.g., grammar and spell checkers) to compensate for areas of weakness. • Assign homework that provides additional practice in basic skills; provide extra scaffolding (e.g., solicit parents' help, explicitly teach effective study habits). • Use reciprocal teaching to promote listening and reading comprehension strategies.
Students with social or behavioral problems	• Frequent off-task behaviors • Inability to work independently for extended periods • Poor social skills	• Use small-group direct instruction and peer tutoring as ways of providing one-on-one attention. • Keep unsupervised seatwork assignments to a minimum. • Use cooperative learning to foster social skills and friendships. • Give explicit guidelines about how to behave during interactive activities; closely monitor students' behavior in small groups. • As appropriate, use strategies previously listed for students with specific cognitive or academic difficulties.
Students with general delays in cognitive and social functioning	• Difficulty with complex tasks • Difficulty thinking abstractly • Need for a great deal of repetition and practice of basic information and skills • Limited ability to transfer information and skills to new situations	• Identify realistic goals related to both academic and social development. • Break complex behaviors into simpler responses that students can easily learn. • Present information in a concrete form (e.g., through hands-on experiences). • Provide extended practice in basic skills. • Embed skills within simple authentic tasks to promote transfer to the real world. • Use peer tutoring to promote friendships with other classmates; also identify skills these students can teach to classmates or younger students.
Students with physical or sensory challenges	• Average intelligence in most instances • Tendency to tire easily (for some) • Limited motor skills (for some) • Difficulty with speech (for some)	• Aim for instructional goals similar to those for general education students unless there is a compelling reason to do otherwise. • Allow frequent breaks from strenuous or intensive activities. • Use instructional software (with any needed adaptations) to individualize instruction. • When students have trouble speaking, provide assistive technology that enables them to participate actively in group activities.
Students with advanced cognitive development	• Rapid learning • Greater frequency of responses at higher levels of Bloom's taxonomy (e.g., analysis, evaluation) • Greater ability to think abstractly; earlier appearance of abstract thinking • Greater conceptual understanding of classroom material • Ability to learn independently	• Identify goals and objectives that challenge students and encourage them to develop to their full potential. • Use expository instruction (e.g., lectures, advanced reading materials, instructional websites) as a way of transmitting abstract information about particular topics quickly and efficiently. • Provide opportunities to pursue topics in greater depth (e.g., through assigned readings or conducting research on the internet). • Teach strategies that enable students to learn on their own (e.g., teach library skills, methods of scientific inquiry). • Ask predominantly higher-level questions. • Introduce students to safe internet outlets where they can communicate with others who have similar interests and abilities. • Use advanced students as peer tutors only if both tutors and learners will benefit.

SOURCES: Strategies based on suggestions from Bryan et al., 2001; Carnine, 1989; Connor, 2006; DuNann & Weber, 1976; Egbert, 2009; Fiedler et al., 1993; Fletcher et al., 2007; Greenwood et al., 1988; Heward, 2009; Kulik et al., 1990; Mercer & Pullen, 2005; Merrill et al., 1996; Morgan & Jenson, 1988; Piirto, 1999; Robinson, 1991; Ruef et al., 1998; Schiffman et al., 1984; Spicker, 1992; Stevens & Slavin, 1995; Sullivan & Conoley, 2004; Tarver, 1992; Turnbull et al., 2010; Wood & Rosbe, 1985.

readers have other cognitive processing deficits; for example, they may have greater-than-average difficulty retrieving words and word meanings based on what they see on the page. In extreme forms, such reading difficulties are known as **dyslexia**, a disability that often has biological roots (Goswami, 2007; Shaywitz et al., 2006; Stanovich, 2000).

Chronic difficulties with written language can have wide-ranging effects, not only for success in other academic disciplines but also for self-esteem. Tom, a second grader, describes his feelings when first trying to learn how to read in first grade:

> I falt like a losr. Like nobad likde me. I was afrad then kais wod tec me. Becacz I wased larning wale . . . I dan not whet to raed. I whoe whte to troe a book it my mom. *(I felt like a loser. Like nobody liked me. I was afraid that kids would tease me. Because I wasn't learning well . . . I did not want to read. I would want to throw a book at my mom.)* (Knapp, 1995, p. 9)

To minimize the academic and psychological damage, we should address students' reading and writing deficits as early as possible, ideally with deliberate and intensive training in both basic skills (e.g., letter recognition, phonological awareness) and more complex processes (e.g., metacognitive skills in reading, composition skills in writing) (Lovett et al., 2017; Meltzer, 2007; Vadasy et al., 2006). In addition, students with chronic literacy difficulties must find *joy* in reading and writing. For example, students might enjoy reading novels such as Rick Riordan's *Percy Jackson and the Olympians* series, which features a boy with dyslexia and ADHD whose disabilities actually work in his favor in his adventures with various god-like characters based on ancient Greek mythology.

Help students with disabilities find joy in literacy activities—ideally with authentic reading and writing activities.

Students' exceptional difficulties with academic subject matter aren't necessarily limited to reading and writing; for instance, some students with learning disabilities continuously struggle with basic concepts and procedures in mathematics (Geary et al., 2012; Wilson & Dehaene, 2007). When working with students who have special educational needs, then, we must typically make accommodations throughout the school curriculum, as the suggestions in Table 13.3 illustrate.

Chapter 5 identifies specific categories of special needs that fall within the five general categories listed in Table 13.3.

Taking Instructional Goals and Student Diversity into Account

Learning Objective 13.6 Choose appropriate instructional strategies for varying instructional goals and different kinds of students.

Let's return to the first of the general principles presented at the beginning of the chapter: *Effective teachers begin their instructional planning by determining what they ultimately want students to know and be able to do.* Table 13.4 presents several general instructional goals we might have, along with useful instructional strategies for accomplishing each. Notice that many of the strategies we've examined in this chapter appear two or more times in the table, reflecting the multiple purposes for which they might flexibly be used.

To some degree, the instructional strategies we choose must also take into account students' ages and developmental levels. For example, strategies that involve a lot of active responding and frequent feedback (e.g., direct instruction, mastery learning) may be especially appropriate for younger students (Brophy et al., 2009; Rosenshine & Stevens, 1986). Lectures (which are often somewhat abstract) and complex homework assignments tend to be more effective with older students (Ausubel et al., 1978; Cooper et al., 2006).

When choosing instructional strategies, take into account students' developmental levels, background knowledge, and self-regulation skills.

The knowledge and skills that students bring to a topic must be considered as well. Structured, teacher-directed approaches are probably most appropriate when students know little or nothing about the topic. But when students have mastered basic knowledge and skills—and especially when they're self-regulating learners—they should begin to direct some of their own learning, perhaps using intelligent tutoring systems, or participating in technology-based collaborative activities or small-group discussions.

In general, however, *all* students should have experience with a wide variety of instructional methods. For example, although some students may need a considerable

COMPARE/CONTRAST

Table 13.4 Choosing an Instructional Strategy

When Your Goal Is to Help Students . . .	Consider Using . . .
Master and review basic skills	• Direct instruction • Lower-level questions • In-class assignments • Homework assignments in which students practice skills they have previously learned in class • Mastery learning • Instructional websites • Computer-based instruction (some programs) • Cooperative learning • Peer tutoring
Gain firsthand, concrete experience with a particular topic	• Authentic activities • Discovery or inquiry learning • Computer simulations
Gain a general, relatively abstract body of knowledge about a topic	• Lectures • Textbooks and other assigned readings • Instructional websites • Intelligent tutoring systems
Connect subject matter to real-world contexts and problems	• Authentic activities • Appropriately designed and scaffolded homework assignments • Inquiry learning • Computer simulations • Technology-based collaborative learning
Acquire advanced understandings about a topic and/or develop complex cognitive processes (e.g., problem solving, critical thinking, scientific reasoning)	• Higher-level questions • Authentic activities • Computer-based instruction (some programs) • Class discussions • Inquiry learning • Intelligent tutoring systems • Cooperative learning • Technology-based collaborative learning
Acquire increased metacognitive awareness and more effective reading comprehension and self-regulation strategies	• Age-appropriate homework assignments that foster independent study habits and scaffold metacognitive processes (e.g., self-questioning, self-monitoring) • Computer-based instruction (some programs) • Reciprocal teaching • Cooperative learning • Peer tutoring (which can enhance tutors' self-regulation skills)
Acquire technological literacy skills	• Regular use of a learning management system • Instructional websites • Computer-based instruction • Computer simulations • Technology-based collaborative learning
Acquire effective strategies for interacting and working with others	• Class discussions • Reciprocal teaching • Small-group inquiry learning • Multiplayer computer simulations and games • Cooperative learning • Peer tutoring • Technology-based collaborative learning

amount of direct instruction to learn and practice basic skills, authentic activities—perhaps within the context of small cooperative groups—can give them a greater appreciation for the relevance and meaningfulness of academic content. Furthermore, too much time in structured, teacher-directed activities can minimize opportunities to choose what and how to study and learn and, as a result, can prevent students from developing the sense of autonomy so important for intrinsic motivation (Battistich et al., 1995; Reeve, 2009).

Chapter 13 What Have You Learned?

This chapter offers many strategies for teaching across diverse subject areas; underlying a good number of them are some common themes. First, we must scaffold students' efforts to construct meaning and to learn from various sources—for instance, from textbooks, websites, historical documents, and maps. Second, we must help students acquire metacognitive processes and epistemic beliefs that will enhance their competencies in various content areas. For example, students must learn how to set goals and monitor their progress in reading, writing, and mathematical problem solving, and they must come to understand that science and social studies are evolving disciplines in which theories (and sometimes even basic "facts") may continue to change as new evidence becomes available. And third, we can often help students acquire more sophisticated understandings, reasoning processes, and metacognitive skills by having them work collaboratively with peers to tackle complex issues and tasks.

As a way of summarizing key ideas in the chapter, we now return to the chapter's learning objectives.

13.1 Explain general principles that can guide your planning and instructional strategies. As teachers, we must choose our strategies on the basis of our instructional goals and objectives, the specific topics we're teaching, and the unique characteristics of our students. More specifically, we should:

- Begin our planning with what we ultimately want students to achieve and then choose instructional strategies accordingly.
- Flexibly combine multiple strategies into each lesson or unit.
- Encourage and support cognitive processes through which students can effectively understand and apply classroom subject matter.
- Focus on knowledge and skills most important for students' long-term success.
- Provide structure and scaffolding appropriate for students' ability levels.
- Capitalize on technological innovations that can enhance students' performance.
- Take individual and group differences into account in instructional decision making.
- Regularly assess students' progress in order to both modify lesson plans and provide constructive feedback.

13.2 Describe important elements of instructional planning, and explain how and why planning and instruction must be closely intertwined. Effective teachers engage in considerable advance planning, and they continually evaluate and modify their plans. They identify the general instructional goals and more specific instructional objectives they would like students to accomplish, and they plan their lessons and instructional strategies accordingly. They conduct task analyses to break complex tasks into smaller and simpler components, and they develop lesson plans that spell out the instructional activities and assessments they'll use each day. And with the increasing availability of technology, many teachers now create class-specific websites that enable them to communicate effectively with students and parents.

13.3 Explain how you can effectively promote students' learning through teacher-directed instructional strategies. In teacher-directed instruction, a teacher is largely in control of the content and course of a lesson. Teacher-directed strategies take multiple forms, but typically they involve some degree of *expository* instruction; that is, they present (expose) information in more or less the same form that students are expected to learn it. Lectures, textbooks, and other predominantly expository approaches are most effective when we apply basic principles of cognitive psychology—for example, when we show students how new material relates to their prior knowledge and help them encode ideas in multiple ways. Many teacher-directed strategies also include ongoing teacher–student interaction. For example, we can encourage students to elaborate on what they've learned through the questions we ask and the feedback we give, and we can provide practice and encourage complex cognitive processes (e.g., transfer, problem solving, critical thinking) through in-class assignments and homework. We can also combine several teacher-directed strategies into direct instruction and/or mastery learning sessions. Instructional websites and technology-based instruction—which often fall midway along the teacher-directed–learner-directed continuum—provide additional options for teaching a variety of academic topics and skills.

13.4 Explain how you can also promote students' learning through more learner-directed strategies. Learner-directed instruction is instruction in which students have considerable control over their learning. Like teacher-directed instruction, it can take a variety of forms. For example, class discussions and technology-based collaborative learning provide arenas in which students can encounter multiple perspectives on complex or controversial topics and build on one another's ideas. Reciprocal teaching encourages more sophisticated metacognition and study skills by modeling and providing practice in effective reading strategies. Structured discovery learning and inquiry learning activities provide opportunities for students to self-construct new knowledge or develop advanced reasoning skills through in-depth observations and/or data analyses. Cooperative learning activities encourage students to work collaboratively on challenging tasks and to mutually support one another's efforts to learn and achieve. And peer-tutoring sessions can help both the tutor and the student being tutored gain better understandings of subject matter.

13.5 **Apply your knowledge of learning, cognition, and effective instructional practices to various academic content domains.** Different content domains involve somewhat different kinds of knowledge; for instance, reading and writing involve knowledge related to spoken language, whereas mathematics involves knowledge related to counting and measurement. The various domains also require particular kinds of thinking and reasoning skills; for instance, scientific investigations require forming hypotheses and testing them through careful separation and control of variables, whereas historical research involves critically evaluating and comparing potentially biased accounts of events and then constructing defensible explanations of what may actually have transpired.

13.6 **Choose appropriate instructional strategies for varying instructional goals and different kinds of students.** Different instructional goals and objectives often require somewhat different instructional strategies. For instance, whereas expository methods may be quite useful in teaching basic knowledge and skills, learner-directed approaches tend to be better for promoting complex cognitive processes such as problem solving and critical thinking. Students' unique characteristics, abilities, and circumstances are important considerations as well. For example, cooperative learning activities may be especially effective with students whose cultural backgrounds encourage cooperation rather than competition, and authentic activities and computer simulations can be quite motivating for students from low-income backgrounds.

Practice for Your Licensure Exam

Cooperative Learning Project

One Monday morning Ms. Mihara begins the unit "Customs in Other Lands" in her fourth-grade class. She asks students to choose two or three students with whom they would like to work to study a particular country. After the students have assembled into six small groups, she assigns each group a country: New Zealand, Colombia, Ireland, Greece, Cambodia, or South Africa. She tells the students, "Today we'll go to the school library, where your group can find information on the customs of your country, print out relevant materials you find on the internet, and check out books and magazines you think might be useful. Every day over the next two weeks you'll have time to work with your group. A week from Friday, each group will give an oral report to the class."

During the next few class sessions, Ms. Mihara runs into many more problems than she anticipated. She realizes that the high achievers have gotten together to form one of the groups, and many socially oriented, "popular" students have flocked to two others. The remaining two groups are composed of whichever students were left over. Some groups get to work immediately on their task, others spend their group time joking and sharing gossip, and still others are neither academically nor socially productive.

As the unit progresses, Ms. Mihara hears more and more complaints from students about their task: "Janet and I are doing all the work; Karen and Mary Kay aren't helping at all," "Mason thinks he can boss the rest of us around because we're studying Ireland and he's Irish," "We're spending all this time but just can't seem to get anywhere!" And the group reports at the end of the unit differ markedly in quality: Some are carefully planned and informative, whereas others are disorganized and have little substance.

1. **Constructed-response question:**

   Describe two things you might do to improve Ms. Mihara's cooperative learning activity. Base your improvements on research findings related to cooperative learning or on contemporary principles and theories of learning, development, or motivation.

2. **Multiple-choice question:**

   Ms. Mihara never identifies an instructional objective for her unit "Customs in Other Lands." Which one of the following statements reflects recommended guidelines about how instructional goals and objectives should be formulated?

   a. "The teacher should expose students to many differences in behaviors and beliefs that exist in diverse cultures (e.g., eating habits, ceremonial practices, religious beliefs, moral values)."

   b. "The teacher should use a variety of instructional practices, including (but not limited to) lectures, direct instruction, textbook readings, and cooperative learning activities."

   c. "Students should study a variety of cultural behaviors and beliefs, including those of countries in diverse parts of the world."

   d. "Students should demonstrate knowledge of diverse cultural practices—for example, by describing three distinct ways in which another culture is different from their own."

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 14

Classroom Assessment Strategies that Promote Learning

Hero Images/Getty Images

Learning Objectives

14.1 Describe the various forms that classroom assessment can take and the various purposes it can serve for teachers and students.

14.2 Explain how you might enhance students' learning through frequent formative assessments and feedback.

14.3 Define and apply four important RSVP characteristics of good assessments: reliability, standardization, validity, and practicality.

14.4 Explain how you might conduct informal assessments, formal assessments, and performance assessments to evaluate students' learning and performance with reasonable reliability and validity.

14.5 Describe individual and group differences that have implications for classroom assessment practices.

CASE STUDY

The Math Test

Ms. Ford is teaching a middle school math class to students with low achievement levels. She has just returned a set of graded test papers, and the following discussion with her students ensues:

Ms. Ford: When I corrected these papers, I was really, really shocked at some of the scores. And I think you will be too. I thought there were some that were so-so, and there were some that were devastating, in my opinion.

Student: [Noise increasing.] Can we take them over?

Ms. Ford: I am going to give them back to you. This is what I would like you to do: Every single math problem that you got wrong, for homework tonight and tomorrow, it is your responsibility to correct these problems and turn them in. In fact, I will say this, I want this sheet back to me by Wednesday at least. All our math problems that we got wrong I want returned to me with the correct answer.

Student: Did anybody get 100?

Ms. Ford: No.

Student: Nobody got 100? [Groans]

Ms. Ford: OK, boys and girls, shhh. I would say, on this test in particular, boys and girls, if you received a grade below 75 you definitely have to work on it. I do expect this quiz to be returned with Mom or Dad's signature on it. I want Mom and Dad to be aware of how we're doing.

Student: No!

Student: Do we have to show our parents? Is it a requirement to pass the class?

Ms. Ford: If you do not return it with a signature, I will call home. (Turner et al., 1998, pp. 740–741)

- What information have the test results actually given Ms. Ford? What inferences does Ms. Ford make based on this information?
- What underlying messages does Ms. Ford communicate about the poor test scores? How might these messages affect students' motivation and the classroom climate?

The only thing Ms. Ford knows for sure is that her students have performed poorly on the test. From this, she infers that they haven't mastered the knowledge and skills the test was designed to assess—an inference that's appropriate *only* if the test is a good measure of what the students have actually learned. When she tells them they must "work on it" and correct wrong answers as a homework assignment, she's putting the blame for their poor scores entirely on their shoulders. Furthermore, with her insistence that students get parents' signatures on the tests, she's focusing their attention on performance goals rather than mastery goals—demonstrating competence rather than actually *acquiring* it—and potentially raising students' anxiety to debilitating levels.

How Ms. Ford tries to communicate students' test scores to parents is yet another issue, as you'll discover in Chapter 15.

Chapter 11 describes the advantages of emphasizing mastery goals over performance goals.

Classroom assessment practices are intertwined with virtually every other aspect of classroom functioning. They affect (a) our future planning and instruction (e.g., what we teach and how we teach it), (b) students' motivation and affect (e.g., what achievement goals they adopt and whether they feel confident or anxious), and (c) the overall classroom climate (e.g., whether it feels psychologically safe or threatening). Only when we consider the very integral roles that assessment plays in the classroom can we truly harness its benefits to help students accomplish important instructional goals. It's essential, then, that we give considerable thought to how we assess learning and achievement, both informally through daily observations of students' behavior and more formally through preplanned assessments.

The Many Forms and Purposes of Assessment

Learning Objective 14.1 Describe the various forms that classroom assessment can take and the various purposes it can serve for teachers and students.

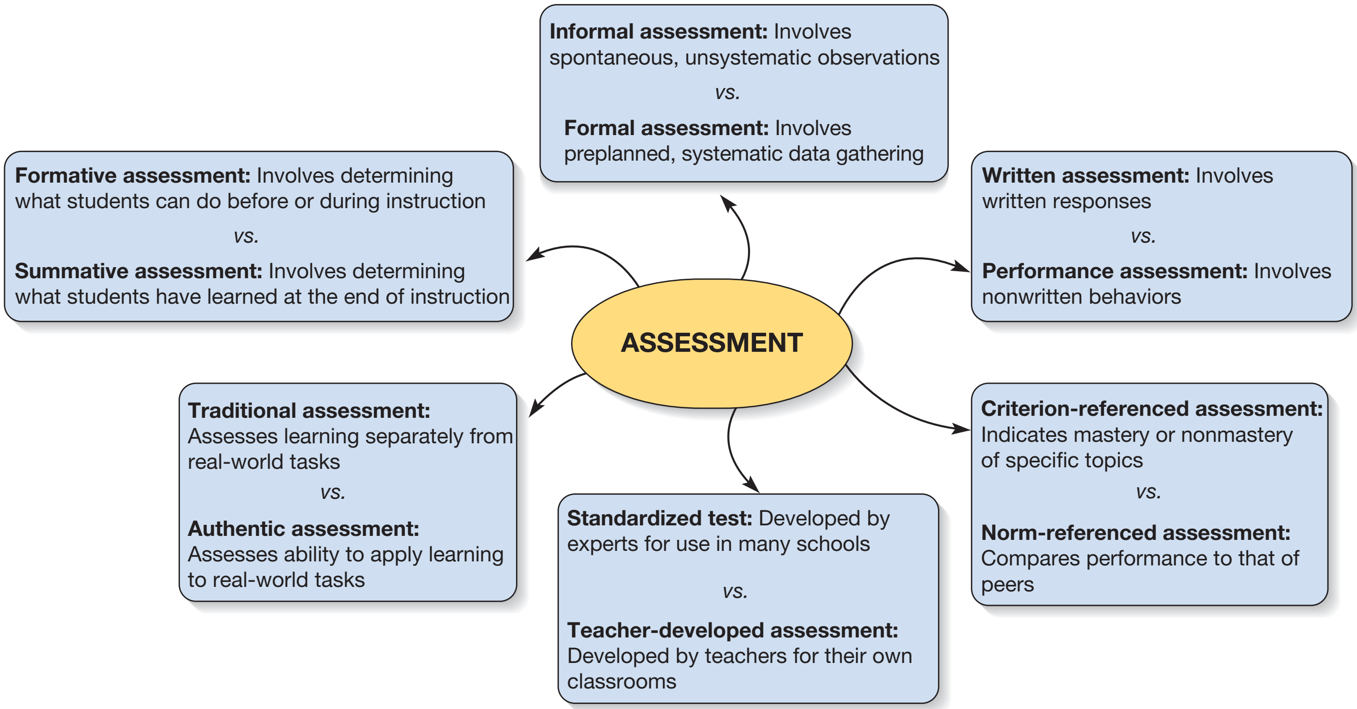
Assessment involves observable indicators of students' knowledge; since we cannot see inside our students' heads, we can only know how they perform in certain situations. Furthermore, an assessment typically involves just a *sample* of our students' behaviors or knowledge; we certainly can't observe and keep track of every single thing that every student does during the school day and at home. Finally, assessment involves drawing *inferences* from the information that we gather to make judgments about students' overall achievements and abilities—a tricky business at best. It's critical, then, that we assess aspects of what our students have learned that can provide reasonably accurate estimates of what students know and can do.

Notice that the definition doesn't include anything about decision making. By themselves, educational assessments are merely *tools* that can help people make decisions about students and sometimes about teachers, instructional programs, and schools as well. When people use these tools for the wrong purposes, or when they interpret assessment results in ways the results were never meant to be interpreted, it's the *people*—not the assessment instruments—that are to blame.

Classroom assessments vary in six key ways, which are summarized in Figure 14.1. Let's look more closely at each distinction.

Formative versus Summative Assessment A **formative assessment** involves determining what students know and can do *before or during instruction*. Ongoing formative assessments can help us determine what students already know and believe about a topic and whether they need further practice on particular skills, and we can develop or revise our lesson plans accordingly (Karpinski & D'Agostino, 2013). In contrast, **summative assessment**

Figure 14.1 The various forms that educational assessment can take.

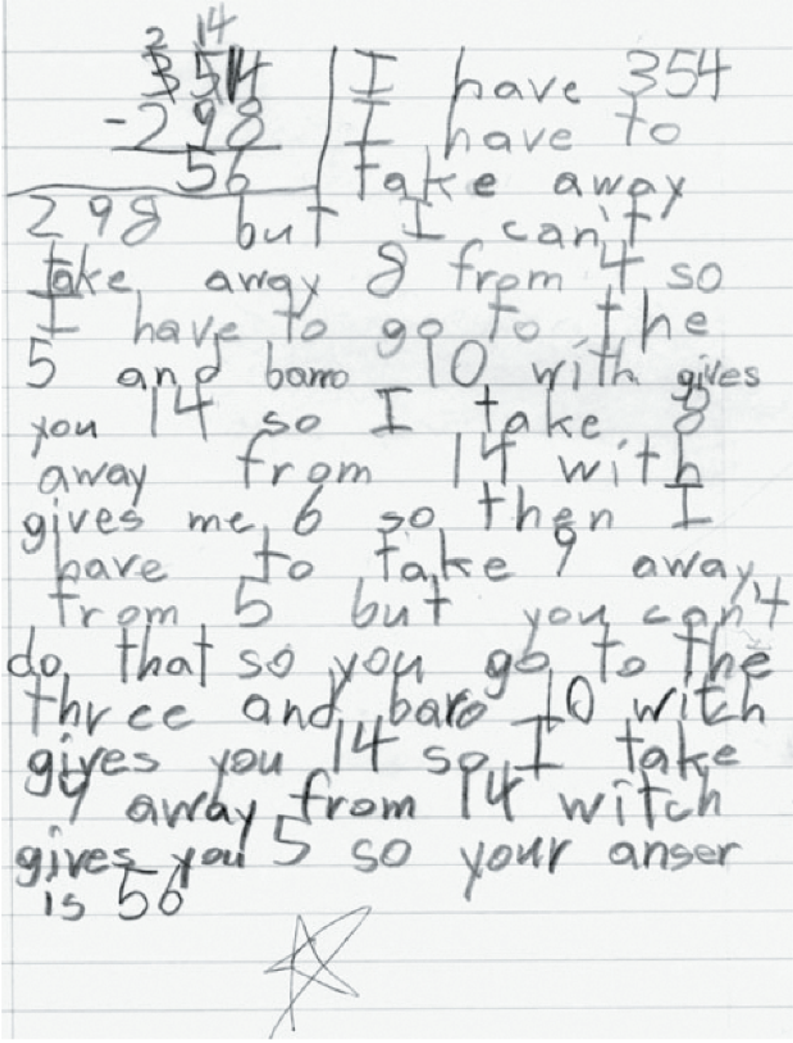

Informal assessment: Involves spontaneous, unsystematic observations
vs.
Formal assessment: Involves preplanned, systematic data gathering
Formative assessment: Involves determining what students can do before or during instruction
vs.
Summative assessment: Involves determining what students have learned at the end of instruction
Written assessment: Involves written responses
vs.
Performance assessment: Involves nonwritten behaviors
ASSESSMENT
Traditional assessment: Assesses learning separately from real-world tasks
vs.
Authentic assessment: Assesses ability to apply learning to real-world tasks
Criterion-referenced assessment: Indicates mastery or nonmastery of specific topics
vs.
Norm-referenced assessment: Compares performance to that of peers
Standardized test: Developed by experts for use in many schools
vs.
Teacher-developed assessment: Developed by teachers for their own classrooms

involves conducting an assessment *after instruction* to make final determinations about what students have achieved. Summative assessments are used to determine whether students have mastered the content of a lesson or unit, what final grades we should assign, which students are eligible for more advanced classes, and the like.

Informal versus Formal Assessment An **informal assessment** involves a spontaneous, unplanned observation of something a student says or does. For example, when Wendy asks, "How come people in Australia don't fall into space?" she reveals a misconception about gravity. An example of an informal assessment is presented in Figure 14.2. In this case, a teacher has asked a third-grade student to solve a math subtraction problem, and to write out in words her thought processes as she thinks through her response. In contrast, a **formal assessment** is planned in advance and used for a specific purpose—perhaps to determine what students have learned from a geography unit or whether they can apply the Pythagorean theorem to real-world geometry problems. Formal assessment is *formal* in several respects: Students can prepare for it ahead of time, it's intended to yield information about particular instructional goals or content-area standards, and a specific time is usually set aside for it (unless it's administered online via asynchronous methods).

The similar names for *formative* assessment and *formal* assessment are sometimes a source of confusion for our readers, but as you've just seen, the two terms refer to

Figure 14.2 An example of an informal assessment of how a student is going about solving a subtraction problem.



2 14
~~354~~
-298
56

I have 354 I have to take away 298 but I can't take away 8 from 4 so I have to go to the 5 and borro 10 with gives you 14 so I take 8 away from 14 with gives me 6 so then I have to take 9 away from 5 but you can't do that so you go to the three and baro 10 with gives you 14 so I take 9 away from 14 witch gives you 5 so your anser is 56 different things. Certainly formative assessments can also be formal ones, in that they're planned in advance to assess students' progress and can guide future instruction. But not all formative assessments are formal ones, and many formal assessments are used for summative rather than formative purposes.

Written Assessments We may sometimes choose written assessments (which include paper–pencil assessments and assessments delivered via technology), in which we present questions or problems that students must address on paper—or, perhaps, an electronic equivalent, such as an online quiz. But we may also find it helpful to use a **performance assessment**, in which students physically demonstrate their abilities—for example, by giving an oral presentation in a language arts class, singing in a concert, or taking prescribed safety precautions in a chemistry lab.

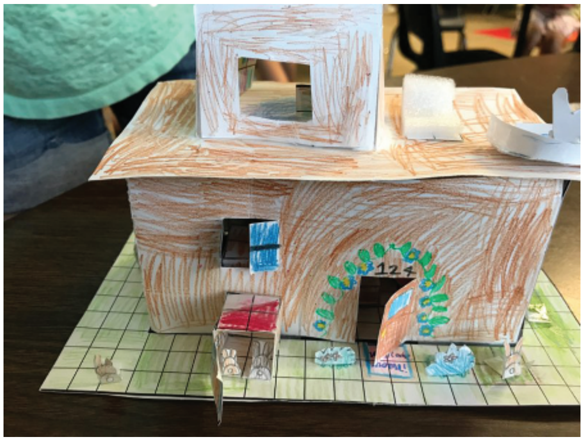
Traditional versus Authentic Assessment Historically, most educational assessments have focused on measuring knowledge and skills in relative isolation from real-world tasks. Spelling quizzes and social studies tests that focus on recalling the dates when various events occurred are examples of such **traditional assessments**. Yet ultimately students must be able to transfer their knowledge and skills to complex situations outside the classroom. The notion of **authentic assessment**—measuring students' knowledge and skills in a real-life (i.e., *authentic*) context—has gained considerable popularity. Keep in mind, however, that the distinction between traditional and authentic assessment really represents a *continuum* rather than an either–or situation: Assessment tasks can resemble real-world situations to varying degrees.

Some authentic assessments involve a written assessment or, alternatively, use of a word processing program. For example, we might ask students to write a letter to a friend or develop a school newspaper. But in many cases authentic assessment is based on non-written performance and closely integrated with instruction. For instance, we might ask students to converse in a foreign language or successfully maneuver a car into a parallel parking space. Figure 14.3 shows a third-grade teacher's end-of-unit math project assessing area and perimeter; for this project students created a three-dimensional house and had to consider and calculate perimeter and area in their designs. Often teachers ask students to create *portfolios* that present a collection of authentic artifacts they've created—perhaps short stories, newspaper editorials, recordings of oral or musical performances, or video recordings of dramatic performances.[1]

Chapter 15 provides more information about both portfolios and standardized tests.

Standardized Tests versus Teacher-developed Assessments Sometimes classroom assessments involve tests developed by test construction experts and published for use in many different schools and classrooms. Such tests, commonly called **standardized tests**, can be helpful in assessing students' general achievement and ability levels. But when we want to assess students' learning and achievement related to specific instructional objectives—for example, whether students have mastered long division or can apply what they've just learned in a social studies lesson—we'll usually want to construct our own **teacher-developed assessments**.

Figure 14.3 Assessment of area and perimeter.



Criterion-referenced versus Norm-referenced Assessments Some assessments, known as **criterion-referenced assessments**, are designed to tell us exactly what students have and haven't accomplished relative to predetermined standards or criteria. A simple example is a test covering a fourth-grade class's 20 spelling words for the week: A score of 20 indicates a perfect paper; a score of 15 indicates 15 correct spellings; and so on. With such a test, we would know precisely which words each student does and doesn't know how to spell.

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[1] Educators aren't in complete agreement in their use of the terms *performance assessment* and *authentic assessment*; many treat them as synonyms. However, we authors find it useful to consider separately whether an assessment involves physical performance (rather than a written assessment) and whether it involves a complex, real-world (authentic) task. Thus we are *not* using the two terms interchangeably.

In contrast, **norm-referenced assessments** reveal how well each student's performance compares with the performance of peers—perhaps classmates or perhaps students from across the nation. For example, ninth graders might take a nationwide mathematics test yielding percentile ranks that indicate how well each student has performed in comparison with other ninth graders around the country. Such scores don't tell us specifically what students have and haven't learned in math; instead, they tell us how well each student stacks up against others at the same age or grade level.

Strictly speaking, any assessment has the potential to tell us *both* what students have learned and how they compare with peers. In reality, however, experienced educators tend to construct the two types of assessments somewhat differently. Ideally, questions and tasks on a criterion-referenced assessment are closely tied to the curriculum and to the particular knowledge and skills we hope students have acquired. If all students have mastered the subject matter to the same degree, it's entirely possible for them all to get the same score. If we want to know how students *differ* from one another—and we'll soon identify some circumstances in which we would want to know that—we must have an instrument that will yield considerable variability in scores. In such an instrument, we're apt to have questions and tasks that vary widely in difficulty level, including some that only a few students can respond to correctly.

With the various kinds of assessments in mind, we now consider how we might use educational assessments for five interrelated purposes.

Guiding Instructional Decision Making

Formative assessments can help us determine a suitable point at which to begin instruction and give us ongoing information about the appropriateness of our instructional goals and the effectiveness of our instructional strategies. For example, if we find that almost all students are completing assignments quickly and easily, we might set our short-term goals and objectives a bit higher. Or if we discover that many students are struggling with important material we've presented only through verbal explanations, we might consider trying a different instructional approach—perhaps a more concrete, hands-on one. Yet summative assessments, too, must guide our decision making to some degree. For example, any mandated standardized tests of students' achievement levels in particular content domains must—for better or for worse—influence the topics and skills on which we focus in our teaching.

In Chapter 15, you'll learn more about such mandated assessments of achievement, especially with regard to their use in high-stakes testing and accountability.

Determining What Students Have Learned from Instruction

In most cases, we'll need to use planned formal assessments—rather than more casual, informal ones—to determine whether students have achieved instructional goals or met certain content-area standards. Formal assessments of achievement are important in mastery-learning approaches to instruction, and they're usually necessary for assigning final grades. School counselors and school psychologists also may use assessments of students' achievement levels to make placement decisions, such as which students are most likely to do well in advanced classes and which might need additional coursework in basic skills.

Use the results of classroom assessments not only to assess what students have learned but also to reflect on the effectiveness of your instructional strategies.

Evaluating the Quality of Instruction

Final measures of student achievement are also useful in evaluating how effective instruction has been. When most students perform poorly after an instructional unit—as Ms. Ford's students did in the opening case study—we must consider not only what students might have done differently but also what we, as teachers, might have done differently. For example, perhaps we moved too quickly through material or provided insufficient opportunities for students to practice critical skills. In any event, consistently low assessment results should tell us that some modification of instruction is in order. We need to refrain from always attributing low scores to students' lack of ability or poor study skills; sometimes we need to reflect on our own practices and consider how we, as teachers, can change some of our instructional strategies.

Diagnosing Learning and Performance Problems

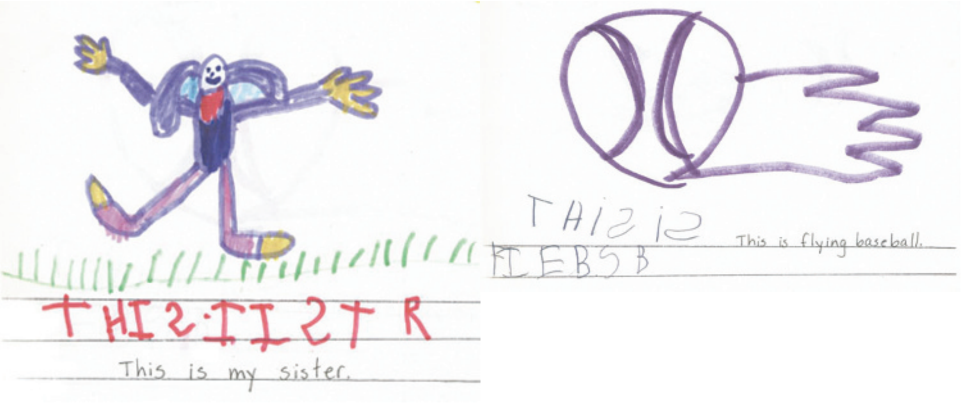
Why is Brett having trouble learning to read? Why does Tammy misbehave every time we assign a challenging task? We ask such questions when we suspect that certain students might learn differently from their classmates and may possibly require special educational services. A number of standardized tests have been designed specifically to identify the particular needs that some students have. Most of these tests require explicit training in their use and thus are often administered and interpreted by specialists (school psychologists, speech pathologists, etc.). As a general rule, the tests tend to be norm-referenced rather than criterion-referenced in order to identify students who are well above or well below their age group with respect to certain abilities or characteristics.

Teacher-developed assessments can provide considerable diagnostic information as well, especially when they reveal consistent error patterns and areas of difficulty (e.g., see Figure 14.4). In other words, teacher-developed assessments can—and ideally *should*—give us information we can use to help students improve.

Increasingly teachers are using short, formative assessments to determine whether certain students might have exceptional instructional needs. In this approach, known as **response to intervention (RTI)**, a teacher regularly assesses students' progress, keeping a lookout for students who have unusual difficulty acquiring certain basic skills (e.g., in reading or math) despite teachers' use of evidence-based practices in both whole-class instruction and follow-up small-group work. Note the importance of *evidence-based practices* here: The teacher must have used instructional strategies that research has shown to be effective for most students. The RTI approach has gained particular popularity as a means of identifying students who have learning disabilities, but it's potentially useful for other students as well (Glover & Vaughn, 2010; Hoover, 2009; Mellard & Johnson, 2008).

See Chapter 5 for more information about *response to intervention* as a diagnostic tool.

Figure 14.4 In these and other work samples, 7-year-old Casey shows consistent difficulty in making connections between the sounds he hears and the sounds he represents in his writing—a difficulty that in his case reflects a learning disability known as *dyslexia*.

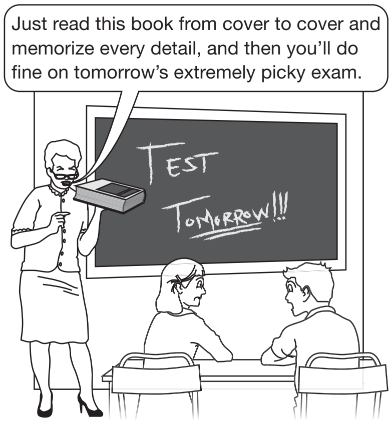


Patricia Belcher

Promoting Learning

Whenever we conduct formative assessments to help us develop or modify lesson plans, we're obviously using assessment to facilitate students' learning. But summative assessment can influence learning as well, and in several ways.

Classroom assessments should be closely aligned with important instructional goals—*not* measures of trivial, isolated facts.


Just read this book from cover to cover and memorize every detail, and then you'll do fine on tomorrow's extremely picky exam.
TEST TOMORROW!!!

- *Assessments can motivate students to study and learn.* On average, students study class material more, review it more regularly, and learn it better when they know they'll be tested on it or in some other way held accountable for it, rather than when they're simply told to learn it (Dempster, 1991; Haertel, 2013; Rohrer & Pashler, 2010). Yet *how* students are assessed is as important as *whether* they're assessed. Assessments are especially effective as motivators when they're criterion-referenced, are closely aligned with instructional goals and objectives, and challenge students to do their best (Mac Iver et al., 1995; Maehr & Anderman, 1993; Meyer et al., 2008). Students' self-efficacy and attributions affect their perceptions of the challenge, of course: Students must believe that success on an assigned task is possible if they exert reasonable effort and use appropriate strategies.

  Although regular classroom assessments can be motivating, they are, in and of themselves, usually *extrinsic* motivators. Thus, they may direct students' attention to performance goals and undermine any intrinsic motivation to learn, especially if students perceive them to be primarily an evaluation of their performance rather than a mechanism for helping them master useful topics and skills (Danner, 2008; Grolnick & Ryan, 1987; Paris & Turner, 1994; Shernoff, 2013).

  With the potentially motivating effects of classroom assessments in mind, let's return to the opening case study. With her focus on students' test scores and parents' approval or disapproval, Ms. Ford is fostering performance goals and extrinsic motivation. Furthermore, notice how controlling, even threatening, some of her statements are: "It is your responsibility to correct these problems and turn them in. . . . All our math problems that we got wrong I want returned to me with the correct answer. . . . If you do not return it with a [parent's] signature, I will call home." Such comments are likely to undermine students' sense of autonomy, and will hardly endear students to mathematics as a content domain.
- *Assessments can influence students' cognitive processes as they study.* Different kinds of assessment tasks can lead students to study and learn quite differently (Carpenter, 2012; Corliss & Linn, 2011; Frederiksen, 1984). Students will typically spend more time studying the things they think will be addressed on an assessment than the things they think the assessment won't cover. Furthermore, their expectations about the kinds of tasks they'll need to perform and the questions they'll need to answer will influence whether they try to memorize isolated facts, on the one hand, or try to think deeply about the content, and integrate it with their prior knowledge.

  Construct assessment instruments that reflect how you want students to think about and cognitively process information as they study.

  As an example, look at the sixth-grade test about rocks shown in Figure 14.5. Part A (identifying rocks shown at the front of the room) might be assessing either basic knowledge or application (transfer) to new situations, depending on whether the students have seen those particular rock specimens before. The rest of the test clearly focuses on memorized facts and is likely to encourage students to engage in rote learning as they study for future tests. For instance, consider the last item: "Every rock has a ______." Students can answer this item correctly *only* if they've learned the material verbatim: The missing word here is "story."

  Chapter 8 discusses epistemic beliefs in more detail.

  Classroom assessments can also influence students' views about the nature of various academic disciplines; that is, they can influence students' **epistemic beliefs**. If we give quizzes that assess knowledge of specific facts, students may conclude that a discipline is just that: a collection of undisputed facts. For example, social studies assessments that primarily address memorization of names, dates, and events can lead students to believe that historical events all happened exactly as they are described in a textbook, rather than encouraging them to consider and

Figure 14.5 Much of this sixth-grade geology test focuses on knowledge of specific facts and may encourage students to memorize, rather than understand, information about rocks.

A. Write whether each of the rocks shown at the front of the room is a sedimentary, igneous, or metamorphic rock.
   1. ________________________
   2. ________________________
   3. ________________________

B. The following are various stages of the rock cycle. Number them from 1 to 9 to indicate the order in which they occur.
   ____ Heat and pressure
   ____ Crystallization and cooling
   ____ Igneous rock forms
   ____ Magma
   ____ Weathering and erosion into sediments
   ____ Melting
   ____ Sedimentary rock forms
   ____ Pressure and cementing
   ____ Metamorphic rock forms

C. Write the letter for the correct definition of each rock group.

1. ____ Igneous	a. Formed when particles of eroded rock are deposited together and become cemented.
2. ____ Sedimentary	b. Produced by extreme pressures or high temperatures below the earth's surface.
3. ____ Metamorphic	c. Formed by the cooling of molten rock material from within the earth.

D. Fill in the blank in each sentence.
   1. The process of breaking down rock by the action of water, ice, plants, animals, and chemical changes is called ________________________ .
   2. All rocks are made of ________________________ .
   3. The hardness of rocks can be determined by a ________________________ .
   4. Continued weathering of rock will eventually produce ________________________ .
   5. Every rock has a ________________________ .

[The test continues with several additional fill-in-the-blank and short-answer items.]

explore diverse perspectives about these events. If, instead, we ask students to take a position on a controversial issue and justify their position with evidence and logic, they get a very different message: that the discipline involves an integrated set of understandings that must be supported with reasoning and are subject to change over time.

- *Assessments can provide valuable feedback about learning progress.* Simply knowing one's final score on a test or assignment isn't terribly helpful. To facilitate students' learning and achievement—and also to enhance students' self-efficacy for mastering academic content—assessment feedback must include specific information about where students have succeeded, where they've had difficulty, and how they might improve (Andrade & Cizek, 2010; Hattie & Gan, 2011). We provide recommendations for how to provide effective feedback in Table 14.1.
- *Assessments can serve as learning experiences in and of themselves.* In general, the very process of completing an assessment helps students review the material and learn it better. Assessment tasks are especially valuable if they ask students to elaborate on or apply the material in a new way (Dunlosky et al., 2013; Foos & Fisher, 1988; Rohrer & Pashler, 2010). Students often do better on summative or end-of-unit assessments when they have been tested on at least part of the unit prior to the summative assessment (Lee & Ahn, 2018). For example, a French teacher might be implementing a two-week unit on food, during which students learn new vocabulary, and learn how to converse using that vocabulary (e.g., learning how to order a meal in a restaurant in French). If the students are quizzed on some

Table 14.1 Recommendations for Giving Effective Feedback

Feedback technique	Example
Provide as much detail as you can in your feedback.	"You did a good job solving this math problem. It's clear to me that the only reason that you came up with the wrong solution is because you seem to have rushed through some parts and made some very minor calculation errors."
Provide specific suggestions for implementation of your feedback.	"Your essay is fantastic, but I notice that you could make smoother transitions between your paragraphs. I suggest that after you finish writing each paragraph, you think about what the next paragraph will be about, and then go back and re-read the paragraph to make sure that the last sentence prepares the reader for what is coming next."
Give some assignments that do not get a formal grade, but just include comments. When you do have to give a grade, make sure that you include at least a few specific comments.	When a student receives a "B" on the write-up of her chemistry lab, the teacher includes the following note: "You did a great job of clearly stating your hypothesis, and then very clearly explaining how you tested the hypothesis. One area for improvement is in your discussion section—you need to return to your original hypothesis, restate it, and talk about how and why you confirmed it."
Feedback should focus on a student's progress over time, but should not compare the performance of one student to that of another.	"You played that piece on the piano very nicely today. I see a real improvement in your tempo since last week."
Provide feedback at a time when the student can benefit from the feedback.	Mr. Jones, a middle school French teacher, is concerned that Jordan is not studying his vocabulary words effectively. Mr. Jones has some specific study-strategy suggestions for Jordan, but rather than providing this feedback during class, Mr. Jones decides to meet privately with Jordan after school to provide this support.
When feasible, feedback should acknowledge and respect student ownership of their work, through conversations.	Mrs. Whitaker, a high school language arts teacher, asked her students to write an essay about whether a character in a short story was justified in lying to her parents. While grading the essays, Mrs. Whitaker disagreed with some of the points that Ashley made in her essay. She engages Ashley in a conversation about her essay, and then tells Ashley, "Okay, now I see where you are coming from. Let's talk about how you can revise this to more clearly articulate your point."
Don't share the distribution of test scores with your students; don't say things like "Only 5 of you got A's," or "I was upset that 2 of you failed this test."	-----
Praise students for using strategies that are under their control; don't praise them for being "smart."	"Way to go! I saw you studying for the quiz in the library this afternoon, and it paid off, your performance really improved over last week's quiz!"
Praise students for trying hard, but be careful about praising effort in students who continue to perform poorly, despite their best efforts.	"I'm so proud of you for sticking with that project . . . it was a real challenge, but you stuck with it and the outcome is just awesome!"
Provide feedback regularly, not just once in a while.	-----

SOURCES: Graham et al., 2015; Griffith et al., 2020; Henderlong & Lepper, 2002; Koenka, 2017; Mueller & Dweck, 1998; National Academies of Sciences, Engineering, and Medicine, 2018; Pekrun et al., 2014; Winstone et al., 2017.

of the vocabulary midway through the unit, they are likely to do better on a final assessment that covers the entire unit at the end of the two weeks.

In summary, sound assessment practices are closely tied to instruction: They reflect instructional goals and content-area standards, guide instructional strategies, and provide a means of tracking students' progress through the curriculum. In a very real sense, assessment *is* instruction: It gives students clear messages about what things are most important for them to accomplish and how best to accomplish them.

Think about how assessment tasks might encourage new learning.

Enhancing Learning Through Ongoing Assessments and Regular Feedback

Learning Objective 14.2 **Explain how you might enhance students' learning through frequent formative assessments and feedback.**

As we've just seen in the preceding section, certain practices associated with summative assessment can have a significant positive impact on learning. But without doubt, it is our *formative assessments*—those that occur before or during instruction rather than after it—that have the greatest potential to enhance learning and achievement (Andrade & Cizek, 2010; Kingston & Nash, 2011; Wiliam, 2011).

Some of the most critical strategies for enhancing learning and achievement through our formative and summative assessments are the following:

- Make assessment criteria explicit and concrete for students.
- Give students regular feedback, delivered in a supportive manner, about how they are progressing.
- Suggest concrete and realistic steps that students can take to improve.

Often, we can accomplish these things, at least in part, by creating general scoring guides that identify key components of desired performance. In some instances, we can use a simple **checklist** of characteristics that should be evident in students' work. For example, Figure 14.6 shows a checklist that one fourth-grade teacher has used for scoring students' performance on math word problems. Notice that the checklist includes both objectively scorable criteria (e.g., the correct answer) and more subjectively scorable criteria (e.g., neatness of work, explanation of the problem solution).

When the focus of instruction is a complex, multifaceted topic or skill, we might instead use a **rubric**—a two-dimensional matrix that identifies criteria for assessing different components of students' performance, along with concrete descriptions of various levels of performance relative to each component. As an example, Table 14.2 shows a rubric for evaluating Wikis on the internet. Rubrics are probably most useful when they have the following characteristics:

- They focus on only a few key attributes of skilled performance and describe these attributes in clear, concrete terms.
- They provide information about how a student's performance has improved over time.
- They also focus on attributes that students can realistically acquire with appropriate instruction and practice.
- They are applicable to many tasks within the content domain. (Arter & Chappuis, 2006; Popham, 2006, 2014; Wollenschläger et al., 2016).

Checklists and rubrics have at least three benefits. First, they give students clear goals toward which to aim. Second, when well constructed, they enable us to evaluate students' performance consistently and with reasonable objectivity (more about this point in an upcoming discussion of *reliability*). And third, they provide a means through which we can give students detailed feedback about the strengths and limitations of their performance—feedback that ideally can help them improve.

Using a checklist or rubric certainly isn't the only way of enhancing students' learning through classroom assessment practices. Other key strategies are these:

- Describe the instructional goals and objectives being assessed in clear, understandable language; align assessments with those goals and objectives.
- Assess students' progress frequently rather than infrequently.
- When giving an assessment, communicate a desire to enhance understanding and promote mastery, rather than to pass judgment.
- Help students recognize important (yet possibly subtle) differences between genuine mastery and more superficial knowledge.
- Engage students in constructive discussions of one another's work, with a focus on ideas for improvement.

Figure 14.6 In this checklist for scoring solutions to mathematics word problems in a fourth-grade class, both teacher and student evaluate various aspects of the student's performance.

		Points Earned	
Elements	Possible Points	Self	Teacher
1. You highlighted the question(s) to solve.	2	____	____
2. You picked an appropriate strategy.	2	____	____
3. Work is neat and organized.	2	____	____
4. Calculations are accurate.	2	____	____
5. Question(s) answered.	2	____	____
6. You have explained in words how you solved the problem.	5	____	____
Total	____	____	____

Table 14.2 Possible Rubric for Evaluating Wikis.

Evaluating Wikis Rubric			
Criteria	**3 Exemplary**	**2 Satisfactory**	**1 Needs Improvement**
Purpose and Theme	The wiki has a well stated clear purpose and theme. Every page on the wiki clearly relates to the purpose.	The purpose and theme of the wiki are somewhat vague. A few pages do not relate well to the theme.	The wiki lacks a clear purpose and theme. Pages are unrelated to the theme.
Organization	The information is well organized into relevant pages that are listed on the sidebar with working links to all pages.	The information is organized into pages; a few pages may be missing from the sidebar or the page links do not work.	The wiki is unorganized. The sidebar does not list pages or the page links do not work.
Content	The wiki content thoroughly addresses the topic, and the content is accurate and balanced.	The wiki content adequately addresses the topic. There are a few inaccuracies or pieces of one-sided information.	The wiki has very little information and/or the information is inaccurate and one-sided.
Higher Order Thinking	Information is interpreted and analyzed with original conclusions that are clearly based on the information.	Information is usually interpreted; a few conclusions are not clearly related to the information.	No attempt was made to interpret or analyze information or draw conclusions.
Multimedia	The wiki includes high-quality graphics, sound, and video that relate to the theme and enhance reader interest or understanding.	The graphics, sound, or video are of average quality and relate to the theme but do not enhance reader interest or understanding.	No multimedia are used or they are of poor quality, do not relate to the theme and distract the reader.
Sources	The wiki includes a rich variety of high-quality, credible sources that are correctly cited.	The wiki includes a variety of sources, although a few are not high quality or are not cited correctly.	The wiki includes only a few sources which are poor quality and not cited.
Links	All links connect correctly to age-appropriate, high-quality sites related to the theme.	Most of the links connect to age-appropriate, high-quality sites related to the theme.	The wiki has no links or the links are age inappropriate or unrelated to the theme.
Conventions	The wiki has no misspellings or grammatical errors.	The wiki has a few misspellings or grammatical errors that do not interfere with the reader's comprehension.	The wiki has many spelling and grammatical errors that interfere with the reader's comprehension.
Collaboration	The wiki is designed to promote communication and collaboration by every student on the team.	The intent of the wiki is to promote communication and collaboration but it is unclear how this will happen.	The wiki is not designed to promote student collaboration and communication.

- Give students opportunities to revise their work based on feedback they've received. (Andrade & Cizek, 2010; Chappuis, 2009; Hattie & Gan, 2011; McDaniel et al., 2011; National Academies of Sciences, Engineering, and Medicine, 2018; Rohrer & Pashler, 2010; Szpunar et al. 2014)

Such strategies can be especially important when working with students who are at risk for academic failure (Hughes, 2010; Wiliam, 2011).

Still another formative assessment strategy is **dynamic assessment**, in which a teacher assesses students' ability to learn something *new*, typically in a one-on-one situation that includes instruction, assistance, or some other form of scaffolding. Such an approach reflects Vygotsky's *zone of proximal development* and can give us an idea of what students might be able to accomplish with appropriate structure and guidance. Dynamic assessment can provide a wealth of information about our students' abilities, cognitive strategies, and approaches to learning. For example, it might give us insights into the following:

See Chapter 2 for a refresher about Vygotsky's zone of proximal development.

- Students' readiness for instruction in particular topics and skills
- Students' motivational and affective patterns (e.g., self-efficacy, achievement goals, attributions, anxiety)
- Students' work habits (e.g., impulsiveness, persistence, reactions to frustration and failure)
- Potential obstacles to students' learning (e.g., distractibility, poor reading comprehension skills, lack of effective self-monitoring and self-evaluation skills) (Feuerstein et al., 2010; Fuchs et al., 2008; Hamers & Ruijssenaars, 1997; Haywood & Lidz, 2007; Seethaler et al., 2012; Tzuriel, 2000)

Including Students in the Assessment Process

Students can benefit greatly when they are involved with the assessment of their academic work (e.g., Sanchez et al., 2017). As noted earlier, classroom assessments are typically extrinsic motivators that provide only externally imposed reasons for learning school subject matter. Yet students learn more effectively when they're *intrinsically* motivated, and they're more likely to be intrinsically motivated if they have some sense of autonomy. Furthermore, if students are to become self-regulating learners, they must acquire skills in self-monitoring and self-evaluation. For such reasons, we should think of assessment as something we do *with* students rather than *to* them (Andrade, 2010; Panadero & Jonsson, 2013; Reeve et al., 2004; Shepard et al., 2005).

Students become more skillful in self-assessment as they grow older (van Kraayenoord & Paris, 1997), but even students in the elementary grades have some ability to evaluate their own performance. Following are several strategies for including students in the assessment process and helping them develop important self-monitoring and self-evaluation skills:

- Solicit students' ideas about assessment criteria and rubric design.
- Provide examples of good and not-so-good products, and ask students to compare them based on several criteria.
- Communicate the importance of being introspective and candid regarding one's own strengths and shortcomings, so that teacher assistance can be most effective.
- Have students compare self-ratings of their performance with teacher ratings (e.g., notice the "Self" and "Teacher" columns in Figure 14.5).
- Ask students to write practice questions similar to those they might see on an upcoming test.
- Have students keep ongoing records of their performance and chart their progress over time. If students are unable to complete an assignment in class because they were inattentive, ask them to think about why their work was not completed, and what they might do differently next time.
- Have students reflect on their work in daily or weekly journal entries, where they can keep track of knowledge and skills they have and haven't mastered, as well as learning strategies that have and haven't been effective.
- Have students compile a portfolio of their work, including self-reflective explanations of what the items in the portfolio reveal about their learning and achievement.
- Ask students to lead parent–teacher conferences. (Andrade, 2010; Brown & Campione, 1996; Chappuis, 2009; McMillan, 2010; Paris & Ayres, 1994; Shepard, 2000; Stiggins & Chappuis, 2012)

It's important, too, that we encourage productive attributions; for instance, students should genuinely believe that they can overcome their existing shortcomings with reasonable effort and good strategies (Andrade, 2010). And we should ask students to develop a follow-up action plan—to explicitly address the question *What do I need to do now?*—based on their assessment results. Such an action plan might include identifying answers to more specific questions such as these:

- What specific things do I need to do to improve?
- What resources and assistance do I need to help me improve?
- How will I know when I have reached my goal? (based on Chappuis, 2009)

Using Digital Technologies in Formative Assessment

Thanks to recent advances in both hardware and software, technology can now make our ongoing assessments of students' progress and achievement increasingly easy and effective. Technology-enhanced assessments can be delivered in a variety of formats.

Assessment software that takes full advantage of the technology, by allowing students to interact with the technology around the topics that are being tested, may be particularly effective for assessing complex knowledge in domains such as science (Quellmaz et al., 2013). For instance, several internet-based resources provide short formative assessments through which we can regularly monitor students' progress in literacy, math, or science. Some examples include:

- Accelerated Reader (www.renaissance.com)
- Diagnoser (www.diagnoser.com)
- DIBELS (Dynamic Indicators of Basic Early Literacy Skills; www.https://dibels.uoregon.edu/)

Some of these resources provide means through which we can immediately enter students' responses onto a handheld digital device, such as a tablet; others present short assessments that students themselves complete on a computer or tablet. The programs keep track of students' performance over time and, at our request, can quickly generate reports and graphs regarding both individual students and an entire class. Thus, they're especially useful in *response-to-intervention* approaches to assessment (described earlier) and *curriculum-based measurement* (to be described a bit later in the section on content validity).

Many software programs can help *students* assess their work. For instance, some web-based programs are specifically designed to help students evaluate qualities of their written work. Such programs provide quick analyses of students' electronically written essays, short stories, and other compositions—whether students have used plausible word combinations, appropriate grammatical structures, and the like. Most word-processing programs also provide this service to some degree through grammar checkers. Certainly, we shouldn't let these programs replace teachers in evaluating students' written work; ultimately, only *people* can reasonably evaluate the accuracy, organization, and logic of what students have written. However, when students use the programs for formative assessment purposes, they can gain substantive feedback that helps them improve the quality of their writing (Russell, 2010).

Other digital technologies can enhance students' self-assessment abilities as well. For example, learning management systems or cloud-based servers provide a good mechanism through which students can voluntarily upload early drafts of their work in order to get their peers' constructive feedback and suggestions. When peers are asked to provide feedback, it's important to make sure that students understand how to provide effective feedback (i.e., by providing explanations and suggestions for alternatives) (Wu & Schunn, 2020). In some cases, we might use a video camera or a tablet or smartphone with a built-in video recorder. For instance, we might make a video of a student's execution of a complex behavior and have the student apply certain criteria in self-evaluating the performance (Stokes et al., 2010b). At one middle school, students designed and built small models of wooden bridges, then made video recordings of their bridges as they placed a brick on top; analyzing the videos frame by frame, they could detect possible flaws in their bridge design (Warschauer, 2011).

Consider how you might use technology to help students assess themselves and give their classmates constructive feedback.

Qualities of Good Assessments

Learning Objective 14.3 Define and apply four important RSVP characteristics of good assessments: reliability, standardization, validity, and practicality.

As a student, have you ever been assessed in a way you thought was unfair? If so, *why* was it unfair?

1. Did the teacher evaluate students' responses inconsistently?
2. Were some students assessed under more favorable conditions than others?
3. Was the assessment a poor measure of what you had learned?

4. Was the assessment so time consuming that after a while you no longer cared how well you performed?

In light of your experiences, what characteristics seem to be essential for good classroom assessment instruments and practices?

The four numbered questions just posed reflect, respectively, four *RSVP* characteristics of good classroom assessments: reliability, standardization, validity, and practicality. Such characteristics are important considerations for any assessment activity, but they're especially important when we're using summative assessments to make potentially life-changing decisions—for instance, decisions about final class grades, placements in advanced classes, and appropriate services for students with disabilities.

Reliability

The **reliability** of an assessment instrument or procedure is the extent to which it yields consistent information about the knowledge, skills, or characteristics being assessed. To get a sense of what reliability involves, try the following exercise.

Experiencing Firsthand

A Visit to the Doctor

Imagine that you go to the doctor's office because you are not feeling well. The nurse takes your temperature, gets a reading of 98.6 degrees, and says, "This looks great!" Then the doctor comes in two minutes later and takes your temperature again, and gets a reading of 103; the doctor says, "This is a high fever. We'd better figure out what's going on here." Then the nurse comes back a few minutes later and takes your temperature yet again, and this time your temperature is 97.1. If you were the patient, how would you feel about this? Your temperature probably would not change this quickly, no matter how sick you are; so why did the doctor and nurse get these readings? One possibility is that there is a problem with the thermometer that is being used; if the thermometer is unable to provide accurate measurements, then it is unreliable. We're fairly sure that your confidence in the thermometer (and maybe in that medical facility) would not be high after such an incident. Now let's look at another example, this time in a school setting.

Fowl Play

Consider this sequence of events in the life of biology teacher Ms. Fowler:

- *Monday.* After completing a lesson on the bone structures of both birds and dinosaurs, Ms. Fowler asks students to write an essay explaining why many scientists believe that birds are descended from dinosaurs. After school, she tosses the pile of essays on the back seat of her cluttered Chevrolet.
- *Tuesday.* Ms. Fowler looks high and low for the essays both at home and in her classroom, but she can't find them anywhere.
- *Wednesday.* Because Ms. Fowler wants to use the students' essays to determine what they've learned, she asks the class to write the same essay a second time.
- *Thursday.* Ms. Fowler finally discovers Monday's essays on the back seat of her car.
- *Friday.* Ms. Fowler grades both sets of essays. She's surprised to find little consistency between them: Students who wrote the best essays on Monday didn't necessarily do well on Wednesday, and some of Monday's poorest performers did quite well on Wednesday.

Which results should Ms. Fowler use: Monday's or Wednesday's? Why?

We certainly want our health to be assessed accurately at the doctor's office. Similarly, when we assess learning, we must be confident that our assessment results will be essentially the same regardless of whether we give the assessment on Monday or Wednesday, whether the weather is sunny or rainy, or whether we evaluate students' responses while we're in a good mood or a foul frame of mind. Ms. Fowler's assessment instrument has poor reliability, because the results it yields are completely different from one day to another. So which day's results should she use? You've just been asked a trick question: There's no way of knowing which set is more accurate.

Any single assessment instrument will rarely yield *exactly* the same results for the same student on two different occasions, even if the knowledge or ability being assessed remains the same. Many temporary conditions unrelated to the knowledge or ability being measured are apt to affect students' performance and almost inevitably lead to some fluctuation in assessment results. For instance, the inconsistencies in Ms. Fowler's two sets of student essays might have been due to temporary factors such as these:

- *Day-to-day changes in students*—for example, changes in health, motivation, and energy level

  A 24-hour flu was making the rounds among Ms. Fowler's students.

- *Variations in the physical environment*—for example, variations in room temperature and outside distractions

  On Monday students who sat by the window in Ms. Fowler's class enjoyed peace and quiet, but on Wednesday they wrote their essays while noisy construction machinery was tearing up the pavement outside.

- *Variations in administration of the assessment*—for example, variations in instructions, timing, and the teacher's responses to students' questions

  On Monday, a few students wrote the essay after school because they had attended a dress rehearsal for the school play during class time. Ms. Fowler explained the task more clearly to them than she had during class, and she gave them as much time as they needed to finish. On Wednesday, a different group had to write the essay after school because of a band concert during class time. Ms. Fowler explained the task very hurriedly and collected the essays before students had finished.

- *Characteristics of the assessment instrument*—for example, the length, clarity, and difficulty of tasks (e.g., ambiguous and very difficult tasks increase students' tendency to guess randomly)

  The essay topic—"Explain why many scientists believe that birds are descended from dinosaurs"—was an ambiguous one that students interpreted differently from one day to the next.

- *Subjectivity in scoring*—for example, judgments made on the basis of vague, imprecise criteria

  Ms. Fowler graded both sets of essays while watching *Chainsaw Murders at Central High* on television Friday night. She gave higher scores during kissing scenes, lower scores during stalking scenes.

All of the factors just listed lead to a certain amount of *error* in students' test scores and other assessment results. Rarely are assessment results perfect measures of what students have learned and can do. Psychologists distinguish among different kinds of reliability, which take different error factors into account. *Test–retest reliability* is the extent to which an assessment instrument yields similar results over a short time interval. *Scorer reliability* is the extent to which two or more independent evaluators of students' performance agree in their judgments. *Internal consistency reliability* is the extent to which different parts of a single instrument all measure the same characteristic. Remember that reliability is important for all types of assessments, not just for high-stakes or unit tests. It might be tempting, for example, to administer formative assessments based on just one or two questions out of convenience; but if we are going to gather meaningful data about our students' learning in order to make decisions about subsequent instruction, then we need to ensure that our formative assessments are reliable (Brookhart & Nitko, 2019).

Appendix B explains how we can determine each of these reliabilities. It also explains how we can estimate the amount of error that a particular assessment result might have.

Whenever we draw conclusions about learning and achievement, we must be confident that the information on which we're basing our conclusions isn't overly distorted by temporary, irrelevant factors. Several strategies can increase the likelihood that an assessment yields reliable results:

- Include a variety of tasks, and look for consistency in students' performance on different types of tasks.
- Define each task clearly enough that students know exactly what they're being asked to do.
- Use a checklist or rubric that identifies specific, concrete criteria with which to evaluate students' performance.
- Try not to let expectations for students' performance influence judgments of *actual* performance (try grading papers without looking at students' names!).
- Avoid assessing students' achievement when they're unlikely to give their best performance—for example, when they're sick.
- Administer the assessment in similar ways and under similar conditions for all students.

The last recommendation suggests that assessment procedures also be *standardized*, especially when—for whatever reason—students need to be compared to one another. We turn to this RSVP characteristic now.

Standardization

The term **standardization** refers to the extent to which an assessment involves similar content and format and is administered and scored in the same way for everyone. Especially in norm-referenced summative assessments, students should all get the same instructions, perform identical or similar tasks, have the same time limits, and work under the same constraints. Furthermore, all students' responses should be scored using the same criteria and standards.

At the beginning of the chapter, we noted that many tests constructed and published by testing experts are called *standardized* tests. This label indicates that such tests have explicit procedures for administration and scoring that are consistently applied wherever the tests are used. Yet standardization is important in teacher-developed assessments as well: It reduces the amount of error in assessment results, especially error due to variation in test administration or subjectivity in scoring. The more an assessment is standardized for all students, then, the higher its reliability.

Furthermore, under most circumstances, it's only fair to ask all students to be evaluated under similar conditions. We find an obvious exception to this guideline in the assessment of students with special educational needs; we'll consider appropriate accommodations for these students near the end of the chapter.

Validity

Earlier you learned about *reliability*. The following exercise can help you determine how well you understand what reliability involves.

Experiencing Firsthand

BTOI

One of us authors recently developed a test called the BTOI: the Bighead Test of Intelligence. It consists of only a tape measure and a *table of norms* that shows how children and adults of various ages typically perform on the test. Administration of the BTOI is quick and easy. You simply measure a person's head circumference just above the eyebrows (firmly but not too tightly) and compare your measure against the average head circumference for the person's age group. People with large heads (comparatively speaking) get high IQ scores. People with smaller heads get low scores.

Does the BTOI have high reliability? Answer the question before you read further.

No matter how often you measure a person's head circumference, you're going to get a similar score: those of us with large heads will continue to be large-headed, and those of us with small heads will always be small-headed. So the answer to our question is *yes:* The BTOI has high reliability because it yields consistent results. If you answered *no,* you were probably thinking that the BTOI isn't a very good measure of intelligence. But that's a problem with the instrument's *validity*, not with its reliability.

The **validity** of an assessment instrument is the extent to which it measures what it's intended to measure and allows us to draw appropriate inferences about the characteristic or ability in question. Does the BTOI measure intelligence? Are scores on a standardized, multiple-choice achievement test a good indication of whether students have mastered basic skills in reading and writing? When our assessments don't do these things well—when they're poor measures of students' knowledge and abilities—we have a validity problem. Thus, whereas it's essential for our assessments to be reliable, we need to understand that reliability does not ensure validity.

As noted earlier, many irrelevant factors influence how well students perform on assessments. Some of these—such as students' health, distractions, and inconsistencies in scoring—are temporary conditions that lead to fluctuation in assessment results from one time to the next and thereby lower reliability. But other irrelevant factors—perhaps reading ability or chronic test anxiety—are more stable, and thus their effects on assessment results will be relatively constant. For example, if Joe has poor reading skills, he may get consistently low scores on multiple-choice achievement tests regardless of how much he has actually learned in science, math, or social studies. When assessment results continue to be affected by the same irrelevant variables, the *validity* of the results is in doubt.

Three kinds of validity that are of particular interest to educators and other practitioners are content validity, predictive validity, and construct validity.

Align classroom assessment instruments and procedures both with relevant content-area standards and with your own specific goals, objectives, and curriculum.

Content Validity Teachers should typically be most concerned with **content validity**—the extent to which assessment questions and tasks are a representative sample of the overall body of knowledge and skills being assessed. Assessments with high content validity are, like effective instruction, closely aligned with instructional goals and any relevant content-area standards. Different goals and standards often require different assessment strategies. In some situations—for example, when the desired outcome is the simple recall of facts—we might ask students to respond to a series of multiple-choice or short-answer questions. In other situations—for example, when the goal is to critique a work of literature or to use principles of physics to explain everyday phenomena—essay tasks that require students to follow a logical line of reasoning might be appropriate. And for some skills—for example, reading aloud or executing a front dismount from the parallel bars—only performance assessments can give us reasonable content validity. In the end, we'll probably find that we can best assess students' achievement with a combination of written assessments and performance assessments.

It is challenging to ensure that your assessments contain valid questions, but this is essential if you truly want to make sure that students have learned what you have intended for them to learn (Smith, 2014). In the United States, teachers often must consider a variety of standards that are put forth by states and professional organizations. As an illustration, Table 14.3 presents examples of reading skills identified in standards for English Language Arts, along with relevant instructional lessons and tasks (Column 3) and assessment strategies (Column 4). Some of the entries in Column 4 can potentially serve as *formal summative assessment* tasks. But notice that the entries to their immediate left (in Column 3) also require students to do, say, or write something—thus providing opportunities for *informal assessment* or *formative assessment* of students' current knowledge and ongoing progress.

Table 14.3 Examples of How You Might Align Classroom Assessments with Standards and Instruction at Different Grade Levels

Grade Level	Examples of Standards for English Language Arts	Examples of Instructional Strategies that Address These Standards and Provide a Means of Informally Assessing Students' Progress	Examples of Assessments that Align with the Standards and with Classroom Instruction
Grade 2	Ask and answer such questions as *who, what, where, when, why,* and *how* to demonstrate understanding of key details in a text. (RI.2.1)[a]	During "settling down" time after lunch each day, read a chapter of a high-interest children's novel, stopping frequently to ask questions that require students to go beyond the text itself (e.g., ask students to speculate about what a character might be feeling).	Meet with students in small groups and ask each member to describe a story in their own words. Follow up with questions such as "What happened next?" and "Why did [a character] do that?" to determine the extent to which each student understood the story.
	Recount stories, including stories from diverse cultures, and determine their central message, lesson, or moral. (RL.2.2)	Have several students create props for and act out a story they recently read. Follow up with a discussion of lessons that one or more story characters might have learned from challenges that they faced.	Give a reading group several age-appropriate Middle Eastern folktales to read, and then ask the students, "What advice do you think this story is giving us?" Communicate that there isn't a single right answer.
Grade 4	Refer to details and examples of a text when explaining what the text says explicitly and when drawing inferences from the text. (RL.4.1)	As a reading group discusses Carl Hiaasen's *Hoot*, ask students to speculate about how the plot might progress and to identify clues in the text that support their predictions.	After students have read the first few chapters of Natalie Babbitt's *Tuck Everlasting* (in which the Tuck family has drunk from a well that gives everlasting life), ask them to write an essay speculating on problems the Tucks' immortality might create for them. Later, after they learn that Mae Tuck has killed someone, ask them to speculate about the implications of her arrest and to back up their predictions with clues in the text.
	Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (RI.4.3)	When students are reading a chapter in their history textbook, ask *why* questions that encourage cause-and-effect connections (e.g., "Why did Columbus's crew want to sail back to Europe after several weeks at sea?").	Ask students to create concept maps that show interrelationships (including cause and effect) among various events during a particular period in history.
Grade 7	Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to the development of the ideas. (RI.7.5)	Before students read a chapter in their science textbook, have them use its headings and subheadings to (1) create an outline of the chapter and (2) generate questions they hope to answer. Then, for homework, ask them to read and take notes on the chapter, using the outline and self-questions as guides for note taking.	Ask students to write a two-page summary of a chapter in their science book, using chapter headings and subheadings to organize their discussion.
	Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (RI.7.8)	Give students an advertisement for a self-improvement product (e.g., exercise equipment); have them work in small groups to (1) identify the advertiser's motives and (2) evaluate the quality of evidence for the product's effectiveness.	Have students examine a website that promotes an allegedly health-promoting product. Ask them to identify possible flaws in the evidence and logic the website uses to convince people to purchase the product.
Grade 12	Analyze and evaluate the effectiveness of the structure an author uses in his or her position or argument, including whether the structure makes points clear, convincing, and engaging. (RI.11–12.5)	Describe common techniques in persuasive writing, and have students identify the various persuasive techniques used in newspaper editorials.	Ask students to (1) identify three specific persuasive techniques used in the U.S. Declaration of Independence and (2) explain their particular purposes and probable effectiveness in the American colonies in 1776.
	Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text. (RI.11–12.6)	Ask students to identify the unstated assumptions underlying two magazines' depictions of the same event (e.g., an assumption that one group is good or right and another is bad or wrong).	Give students a magazine article describing a recent event. Ask them to underline five sentences that reveal the author's cultural and/or political biases and to describe those biases in a two-page essay.

[a] The letters "RL" indicate standards related to reading literature; the letters "RI" indicate standards related to reading informational text. The number or numbers before the period indicate the grade level; the number after the period indicates the particular standard for that grade level. For example, the first entry shown here, identified as "RL.2.1," is the first standard for grade 2 for reading literature.

SOURCE: Entries in the column "Examples of Common Core Standards for English Language Arts" are from *Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical subjects*. Copyright © 2010 by National Governors Association Center for Best Practices and Council of Chief State School Officers.

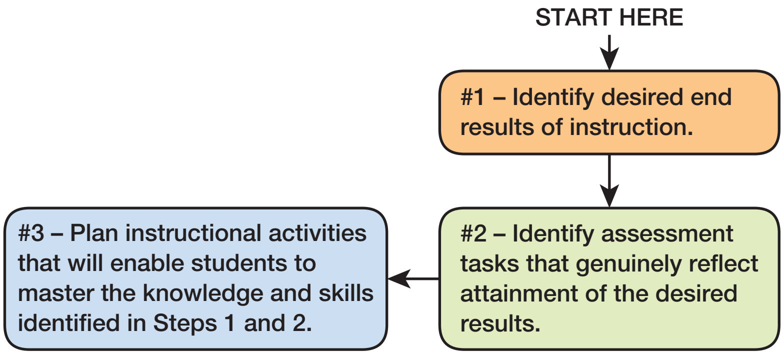

START HERE
#1 – Identify desired end results of instruction.
#2 – Identify assessment tasks that genuinely reflect attainment of the desired results.
#3 – Plan instructional activities that will enable students to master the knowledge and skills identified in Steps 1 and 2.

Figure 14.7 Using a backward design to plan assessment tasks.

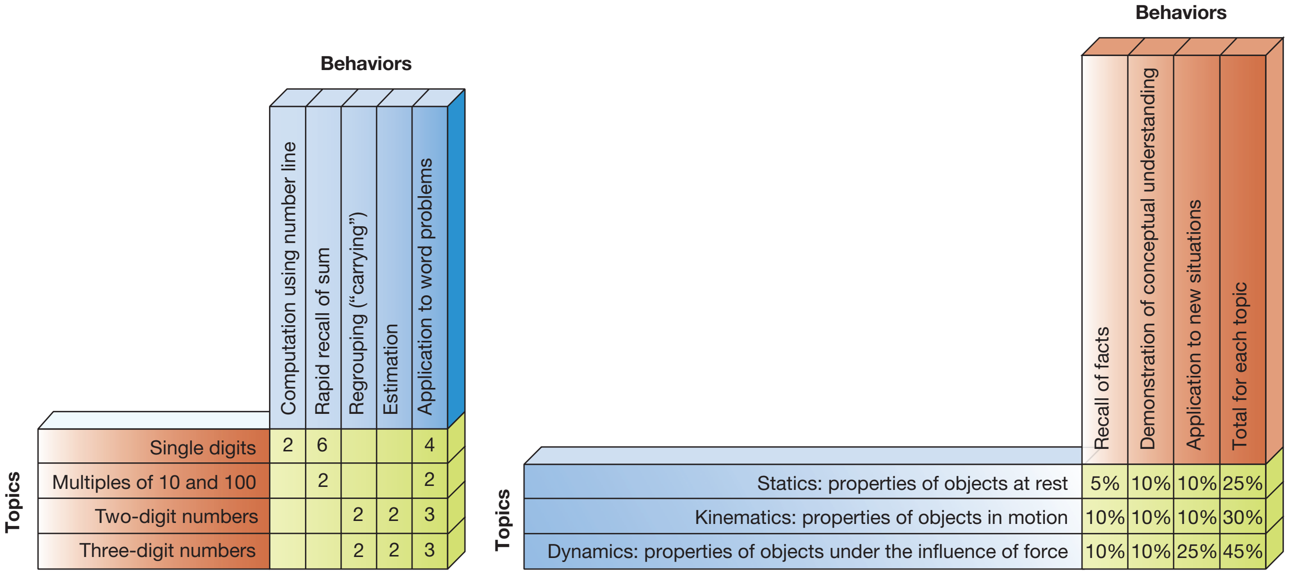
One helpful framework for planning assessments with good content validity is a **backward design**, as illustrated in Figure 14.7. More specifically, we begin with what we ultimately want students to achieve in our classes: We consider any applicable content-area standards and identify more specific instructional goals (Step 1). We then identify one or more suitable methods to assess students' achievement of the desired end results (Step 2). Finally, we plan instructional strategies that will enable students to master the important knowledge and skills we've identified (Step 3).

Another strategy for enhancing content validity in *formative* assessments is **curriculum-based measurement (CBM)**, which is especially useful both in basic skills instruction and in a response-to-intervention approach to identifying persistent learning problems. In this approach teachers regularly administer assessments that each focus on a single, specific skill in the curriculum (e.g., word recognition in reading, addition of two-digit numbers) as a means of tracking individual students' progress. Each assessment is typically quite short (perhaps only 1 to 4 minutes in length) and yet can help teachers identify students who may need additional instruction in a certain skill in order to move forward. In recent years, some of the software programs mentioned earlier, such as DIBELS, have made CBM increasingly easy and powerful.

Recall that we introduced backward design to you in Chapter 13.

High content validity is, of course, also important whenever we're using an assessment instrument for *summative* assessment purposes—that is, to determine what knowledge and skills students have ultimately acquired from instruction. When a summative assessment addresses multiple topics, concepts, and skills, we can't necessarily include each and every one of them in the assessment. But taken as a whole, the things we ask students to do in the assessment should be made up of a *representative* sample of the content we're assessing. The most widely recommended strategy is to construct a blueprint that identifies the specific things we want to assess and the proportion of questions or tasks that should address each one. This blueprint often takes the form of a **table of specifications**: a two-way grid that indicates both what topics should be covered and what students should be able to *do* with each topic. Each cell of the grid indicates the relative importance of each topic–behavior combination, perhaps as a particular number or percentage of tasks to be included in the overall assessment. Figure 14.8 shows

Figure 14.8 Two examples of a table of specifications.


Behaviors
Topics
Behaviors
Topics

Topics	Computation using number line	Rapid recall of sum	Regrouping ("carrying")	Estimation	Application to word problems
Single digits	2	6			4
Multiples of 10 and 100		2			2
Two-digit numbers			2	2	3
Three-digit numbers			2	2	3

Topics	Recall of facts	Demonstration of conceptual understanding	Application to new situations	Total for each topic
Statics: properties of objects at rest	5%	10%	10%	25%
Kinematics: properties of objects in motion	10%	10%	10%	30%
Dynamics: properties of objects under the influence of force	10%	10%	25%	45%

Bloom's taxonomy is described in Chapter 13.

To enhance the content validity of a summative assessment, develop a table of specifications that can guide your selection of topics and tasks.

two examples. The table on the left, constructed for a 30-item quiz on addition, assigns different weights (i.e., different numbers of test items) to different topic–behavior combinations, with some combinations intentionally not being assessed at all. The table on the right, constructed for a high school physics unit on classical mechanics, instead uses percentages to identify the relative weights assigned to different topic–behavior combinations; the three behaviors it includes are based loosely on the first three processes in Bloom's taxonomy (*remember, understand, apply*). Both tables in Figure 14.8 intentionally place greater emphasis on some topic–behavior combinations than on others, but in other situations, equal weightings across the board might be quite appropriate.

Content validity is important not only for teacher-developed assessments but also for any published achievement tests. A table of specifications can help us in this situation as well, but this time we *start with the test* and then determine the degree to which it matches our curriculum. More specifically, we create a two-dimensional table that includes both the topics and the behaviors we want to assess. We look closely at the items in the test and count the number of items that fall into each cell in our table (sometimes the test publisher provides such a table). We can then decide whether the test matches our curriculum closely enough that it has content validity for our particular situation—that is, whether it reflects what we actually do in our classrooms.

Four words in the last sentence of the preceding paragraph—*for our particular situation*—are especially important. We can't *ever* say that a certain achievement test has high or low content validity in general. A test might have good content validity for the curriculum of some schools and classrooms but little or no content validity in other circumstances.

Predictive Validity Shantel is thinking about a career in mathematics. But even though she's doing well in her eighth-grade math class, she worries that she'll eventually have trouble with advanced courses in trigonometry and calculus. To get an idea of her chances for future math success, Shantel takes the Mathematics Aptitude Test (MAT) that her school counselor makes available to her. Shantel does quite well on the MAT, bolstering her confidence that she can succeed in a mathematics career. But does the MAT actually measure a student's potential for success as a mathematician? This is a question of **predictive validity**—the extent to which an assessment instrument accurately predicts future performance in some arena.

See Appendix B for details about how predictive validity is calculated.

Publishers of standardized, norm-referenced ability tests often determine, mathematically, the accuracy with which test scores predict later success in certain domains. Keep in mind, however, that, as is true for content validity, a test has no *single* predictive validity. Its validity in a given situation depends on the specific behavior being predicted, the age group being assessed (e.g., many tests have greater predictive validity for older students than for younger ones), and the amount of time between the test and the predicted performance.

Construct Validity In psychology, a *construct* is an internal trait that can't be directly observed but must instead be inferred from consistencies we see in people's behavior. *Motivation, self-efficacy,* and *intelligence* are all constructs; we can't actually *see* any of these things but must instead draw conclusions about them from what students do and don't do. For example, we might use our observations of students' on-task and off-task behaviors to make inferences about their self-efficacy for various topics and skills. Similarly, we might use students' performance on abstract reasoning tasks as evidence of their general intelligence.

By **construct validity**, then, we mean the extent to which an assessment instrument actually measures a specific abstract, unobservable characteristic. Construct validity is of most concern when we're trying to draw general conclusions about students' traits and abilities—perhaps when we're trying to identify certain disabling conditions that may require specialized instruction and support systems. The problem with the Bighead Test of Intelligence (BTOI) described earlier is one of poor construct validity: Despite its high reliability, the scores it yields have nothing to do with intelligence.

How do we determine whether a test or other assessment instrument measures something we can't actually *see*? Assessment experts have developed a variety of strategies for doing so. For example, they might determine how well assessment results correlate with other measures of the same trait (e.g., do scores on one intelligence test correlate with scores on other IQ tests?). They might also find out whether older students perform better than younger students on instruments measuring traits that presumably increase with age (e.g., do 12-year-olds correctly answer more items on an intelligence test than 6-year-olds?). Or they might compare the performance of two groups known to be different with respect to the trait in question (e.g., do nondisabled 12-year-olds perform better on an intelligence test than 12-year-olds who have been identified as having an intellectual disability?). When data from a variety of sources are consistent with what we would expect if the instrument is a good measure of the characteristic in question, we conclude that it probably does have construct validity.

One principle applies to all three forms of validity: *Virtually any assessment tool is more valid for some purposes than for others*. A math achievement test may be a valid measure of how well students can solve arithmetic word problems but a terrible measure of how well they can apply arithmetic to real-life situations. And a written quiz on the rules of tennis may accurately assess students' knowledge of how many games are in a set, what *deuce* means, and so on, but it probably won't tell us much about how well students can actually play the game.

Practicality The final RSVP characteristic is **practicality**—the extent to which assessment instruments and procedures are easy to use. Practicality encompasses issues such as these:

- How much time will it take to develop the questions and/or tasks to be administered?
- Can the assessment be administered to many students at once, or is one-on-one administration required?
- Are expensive materials involved?
- How much time will the assessment take away from instructional activities?
- How quickly and easily can students' performance be evaluated?

There's often a trade-off between practicality and characteristics such as validity and reliability. For example, a true–false test on tennis would be easier to construct and administer, but a performance assessment in which students actually demonstrate their tennis skills—even though it would take more time and energy—would undoubtedly be a more valid measure of how well students have mastered the game.

The four RSVP characteristics of good assessments are summarized in Table 14.4. Of these, *validity is the most important:* We must use assessment techniques that validly assess students' achievement of instructional goals and objectives. Yet we should keep in mind that *reliability is a necessary condition for validity*. Reliability doesn't guarantee validity, however, as the earlier BTOI exercise illustrated. Standardization is most relevant to summative assessments, particularly norm-referenced ones in which each student's performance is evaluated in comparison with that of peers. Furthermore, standardization can enhance the reliability of assessment results and hence can indirectly enhance their validity. Practicality should be a consideration only when validity isn't lost in the process.

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Table 14.4 RSVP Characteristics of Good Assessment

Characteristic	Definition	Relevant Questions to Consider	Comments
Reliability	The extent to which an assessment instrument or procedure yields consistent results for each student	• How much are students' scores affected by temporary conditions unrelated to the characteristic being assessed (*test–retest reliability*)? • Do different people score students' performance similarly (*scorer reliability*, also known as *interrater reliability*)? • Do different parts of a single assessment instrument lead to similar conclusions about a student's achievement (*internal consistency reliability*)?	Reliability is a necessary condition for validity.
Standardization	The extent to which an assessment instrument or procedure is similar for all students	• Are all students assessed on identical or similar content? • Are all students asked to perform the same types of tasks? • Is everyone given the same instructions? • Do all students have the same time limits? • Is everyone's performance evaluated using the same criteria?	Standardization is essential for legitimate and equitable comparisons among students (e.g., in norm-referenced tests). It's less important when assessments are used to guide and individualize instruction. Also, appropriate accommodations must be made for students with disabilities.
Validity	The extent to which an instrument or procedure actually assesses what it is intended to assess and enables appropriate inferences to be made	• Does the assessment tap into a representative sample of the content domain being assessed (*content validity*)? • Do students' scores predict their later success in a domain (*predictive validity*)? • Does an assessment accurately measure a particular psychological or educational characteristic (*construct validity*)?	Validity must be the most central concern in all classroom assessments. Assessment results are meaningless unless they're closely aligned with instructional goals and the academic curriculum.
Practicality	The extent to which an assessment instrument or procedure is easy and inexpensive to use	• How much time does the assessment take? • How quickly and easily can responses be scored? • Is special training required to administer or score the assessment? • Does the assessment require specialized materials that must be purchased?	Especially when using summative assessments to make potentially life-altering decisions, practicality should be a consideration only to the extent that validity isn't seriously jeopardized. Brief formative assessments should be highly practical so that they don't consume much instructional time.

Assessing Students' Progress and Achievement Both Informally and Formally

Learning Objective 14.4 **Explain how you might conduct informal assessments, written assessments, and performance assessments to evaluate students' learning and performance with reasonable reliability and validity.**

Effective teachers regularly draw inferences both from their ongoing, daily observations of students' behaviors and from students' performance on preplanned assessments. We examine each of these strategies now.

Informally Observing Students' Behaviors

From our daily observations of students' behaviors, we can discover a great deal about what students have and haven't learned, enabling us to make reasonable decisions about future instruction. For example, we can:

- Ask questions during a lesson (see the Into the Classroom feature "Asking Questions to Assess Learning and Achievement Informally").
- Listen to what and how much students contribute to whole-class and small-group discussions; make note of the kinds of questions they ask.

- Have students write daily or weekly entries in personal journals.
- Observe how well students perform physical tasks.
- Consider students' motivation during class activities; pay attention to their valuing of various tasks, their self-efficacy, and their attributions when they experience success or failure.
- Identify the kinds of activities in which students engage voluntarily.
- Watch for body language that may reflect students' feelings about particular tasks.
- Observe students' interactions with peers in class, at lunch, on the playground, in the hallways, or during school social or athletic events.
- Look at the relative frequency of on-task and off-task behaviors; look for patterns in *when* students are off task.

Informal assessment has several advantages. First, it gives us feedback about the effectiveness of the day's instructional activities. Second, it's easily adjusted at a moment's notice; for example, when students reveal misconceptions about a topic, we can ask follow-up questions that probe their beliefs and reasoning processes. Third, informal assessment provides information that may either support or call into question the data we obtain from more formal assessments such as tests and quizzes; for instance, it might provide more optimistic assessments of English language learners. Finally, ongoing observations of students' behaviors provide clues about social, emotional, and motivational factors affecting students' classroom performance and may often be the only practical means through which we can assess such goals as "Shows courtesy" and "Enjoys reading."

Don't take any single observation of a student's behavior too seriously; instead, look for patterns over time.

RSVP Characteristics of Informal Assessments When we get information about students' characteristics and achievements through informal means, we must be aware of the strengths and limitations of this approach with respect to reliability, standardization, validity, and practicality.

Keep written records of what students say and do, especially if final assessments will depend heavily on in-class observations.

Reliability. Most informal assessments are quite short, and such snippets of students' behavior aren't always reliable indicators of their overall accomplishments and dispositions. Perhaps we happen to ask Manuel the *only* question to which he doesn't know

Into the Classroom

Asking Questions to Assess Learning and Achievement Informally

- **Direct questions to everyone in class, not just to a few students who seem eager to respond.**

  The girls in a high school science class rarely volunteer when their teacher asks questions. Although the teacher often calls on students who raise their hands, he occasionally calls on those who don't, and he makes sure that he calls on *every* student at least once a week.

- **When a question has only a few possible answers, have students anonymously vote on the particular answers they think are correct.**

  When beginning a lesson on dividing one fraction by another, a middle school math teacher writes this problem on the board:

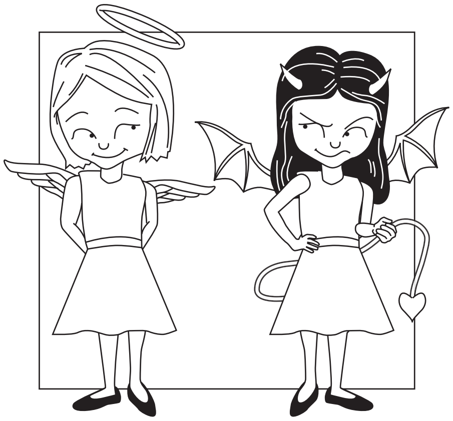
  $$(3/4 \div 1/2) = ?$$

  She asks, "Before we talk about how we solve this problem, how many of you think the answer will be less than 1? How many think it will be greater than 1? How many think it will be exactly 1?" To avoid having students feel self-conscious about their answers, she has the students use an app where they can "vote" anonymously. She tallies the responses and then says, "Hmmm, most of you think the answer will be less than 1. Let's look at how we solve a problem like this. Then each of you will know whether you were right or wrong."

- **Ask follow-up questions to probe students' reasoning.**

  In a geography lesson on Canada, a fourth-grade teacher points to the St. Lawrence River on a map and asks, "Which way does the water flow, toward the ocean or away from it?" One student shouts out, "Away from it." "Why do you think so?" the teacher asks. The student's explanation reveals a common misconception: that rivers can flow only from north to south, never vice versa.

the answer. When we use informal assessment to draw conclusions about what students know and can do, we should base our conclusions on many observations over a long period. Given the fact that our long-term memories can never be totally accurate, dependable records of our observations, we should keep ongoing, written records of what we see and hear (Miller et al., 2009; Stiggins & Chappuis, 2012).



Teachers tend to evaluate well-behaved students as achieving at higher levels than badly behaved students, even when the students' actual academic achievement levels are the same.

Standardization. Informal assessments can rarely, if ever, be standardized; for example, we're apt to ask different questions of different students, and we'll probably observe each student's behavior in different contexts. Hence, such assessments definitely *don't* give us the same information for each student. In most cases, then, we can't make legitimate comparisons among students merely on the basis of a few casual observations.

Validity. Even when students' behavior is consistent over time, it won't always give us accurate data about what students know and can do. For example, Tom may intentionally answer questions incorrectly so that he doesn't come across as a know-it-all, and Cameron may be reluctant to say anything because of a chronic stuttering problem. In general, when we use in-class questions to assess students' learning, we must keep in mind that some students—especially females and students from diverse ethnic backgrounds—may be less likely to respond than others. Meanwhile, other students may speak with such confidence that they lead us to believe they know more than they actually do (Castagno & Brayboy, 2008; Rogoff, 2003; Stiggins & Chappuis, 2012; Wentzel, 2009).

Our personal biases and expectations can also come into play both in our informal assessments and in the ways that we provide feedback to our students (Carbonneau & Selig, 2011; Harber et al., 2019; Ritts et al., 1992; Robinson & Lubienski, 2011). We typically impose meanings on what we see and hear based on things we already know or believe to be true. For instance, we're apt to expect academic or social competence from students we like or admire and thus perceive their actions in an overly positive light—a phenomenon known as the **halo effect**. In much the same way, we might expect inappropriate behavior from students with a history of misbehavior (e.g., Zimmermann et al., 2013), and our observations might be biased accordingly—a phenomenon aptly called the **horns effect**. Despite our efforts to be impartial judges, any expectations we have for students based on their ethnic backgrounds or socioeconomic status can unfairly bias our judgments of their performance (Ready & Wright, 2011; van den Bergh et al., 2010).

Chapter 11 describes additional effects of teacher expectations.

Practicality. The greatest strength of informal assessment is its practicality. It involves little or none of our time either before or after the fact, except when we keep written records of our observations. It's also quite flexible: We can adjust our assessment procedures on the spot as circumstances change.

Despite the practicality of informal assessment, we've just noted serious problems regarding its reliability, standardization, and validity. Hence, we should treat any conclusions we draw only as *hypotheses* that we must either confirm or disconfirm through other means. In the end, we must rely more heavily on preplanned, formal assessment techniques to determine whether our students have achieved instructional goals and met content-area standards.

Treat the conclusions you draw from informal assessment as hypotheses that need confirmation through more formal means.

Using Formal Classroom Written Assessments

When we need to conduct a formal assessment, we can use either written or technology-delivered assessments, both of which are typically easier and faster—and thus have greater practicality—than performance assessment. Questions that require brief responses—such as multiple-choice and short-answer questions—are often suitable for assessing students' knowledge of single, isolated facts. Assessments that require extended responses—such as essay questions and geometry proofs—more easily lend themselves to evaluation of complex cognitive processes, such as logical reasoning and problem solving. However, item type alone doesn't tell us whether we're assessing simple or complex thinking skills. For example, it's quite possible (and also quite common) for an essay question to ask students only to retrieve and explain things they've previously been taught, and some teachers are quite creative in writing multiple-choice questions that require students to apply subject matter to new situations. The following exercise provides examples.

Experiencing Firsthand

Quiz time!

Answer the following questions. Do not read ahead until after you have answered these questions:

- Who was the fourth President of the United States?
- What is the capital of Nevada?

Now, answer this next question:

- Who was the fourth President of the United States? (a) George Washington (b) Abraham Lincoln (c) James Madison (d) John F. Kennedy
- What is the capital of Nevada? (a) Sacramento (b) Carson City (c) Albany (d) Nashville

The correct answers are James Madison and Carson City. Most likely, the first questions were rather difficult, whereas the second set was probably easy to answer. One very important distinction to consider regarding various item formats is whether they involve recognition or recall. A **recognition task** (e.g., a multiple-choice, true–false, or matching question) asks students to identify a correct answer within the context of incorrect statements or irrelevant information. In contrast, a **recall task** (e.g., a short-answer question, word problem, or essay task) requires students to generate the correct answer themselves. The first versions of the questions about the fourth President and about Nevada's capital were examples of recall tasks, whereas the second versions were recognition tasks. When a recall task requires a lengthy response—and especially when it also involves elaborating on, analyzing, synthesizing, or applying information in new ways—it's sometimes called a **constructed-response task**.

Recognition items have two major advantages. First, we can often include a relatively large number of questions and tasks in a single assessment, enabling us to get a representative sample of a broad content domain and hence potentially increasing content validity. In addition, we can score students' responses quickly and consistently, thus addressing our need for practicality and reliability. However, recognition tasks tend to overestimate achievement: Students can sometimes guess correctly when they don't know the material very well.

When our instructional goal involves retrieving knowledge and skills *without* the benefit of seeing the correct answer within the context of distracting information, and especially when we want to examine students' reasoning processes—for instance, their ability to justify a particular point of view on a controversial topic—recall tasks generally have greater validity than recognition tasks. Also, students tend to study material more thoroughly and remember the material better when they're preparing for recall rather than recognition test questions (D'Ydewalle et al., 1983; Roediger & Karpicke, 2006; Rohrer & Pashler, 2010). But because students may require considerable time to respond to each recall item, we'll be able to present fewer items in a single assessment session (adversely affecting reliability) and will tap a more limited sample of the content

Use recognition tasks to assess students' ability to identify facts, especially when the content domain is large. Use recall tasks when it's important to assess students' ability to retrieve information on their own and use it in new ways.

domain (potentially affecting content validity). In addition, we'll typically take longer to score such items (a practicality issue) and will make more errors in scoring them (another reliability issue).

Constructing a Formal Assessment Most recognition assessment items take one of three basic forms:

- An *alternative-response item* is one for which there are only two or three possible answers (e.g., *true* versus *false, fact* versus *opinion*) for all items in a series.
- A *multiple-choice item* consists of a question or incomplete statement (the *stem*) followed by one correct answer and several incorrect alternatives (*distractors*).
- A *matching item* presents two columns of information; students must match each item in the first column with an appropriate item in the second.

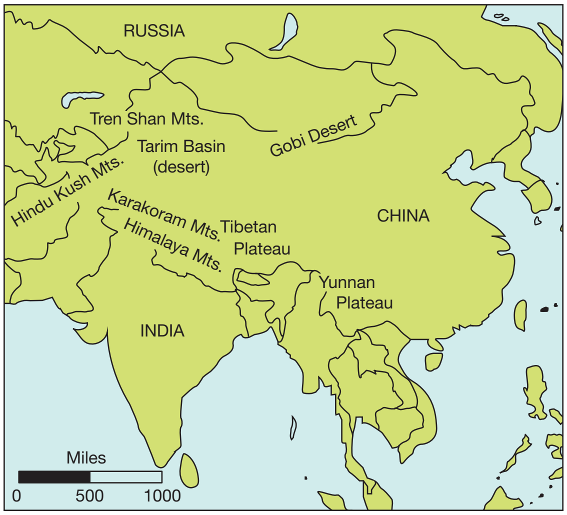
Of these three formats, most assessment experts recommend multiple-choice items. Multiple-choice items have two advantages relative to other recognition items. First, the number of items students can answer correctly simply by guessing is relatively low, especially in comparison with alternative-response items (for example, when multiple-choice items have five possible answers, students can get only about 20% of them correct through guessing alone). Second, other things being equal, the multiple-choice format lends itself most readily to measuring complex thinking skills.

Recall items range widely in format and are essentially limited only by our imaginations. Some are quite simple and straightforward—for instance, "How much is two plus two?" and "What's the capital of France?" Others may call for considerable thought. For example, we might give students a problem that requires them to manipulate or synthesize data and develop a solution. Alternatively, we might give students new material (e.g., a table, graph, map, or section of text) and ask them to analyze and draw conclusions from it. Figure 14.9 presents an example.

With RSVP characteristics of good assessments in mind, we offer the following general recommendations for constructing formal assessments.

- *Combine multiple formats in a single assessment.* Often we'll want to assess students' ability to synthesize, evaluate, or in other ways elaborate on the things they've learned, and we can usually do this more easily with constructed-response tasks. Yet assessments consisting of only one or two lengthy constructed-response items don't always provide a representative sample of the topics and skills being assessed, and any errors in scoring a single item can seriously impact students' overall scores. A workable compromise is to combine both quick-response recognition and recall items—which allow broad sampling—and lengthier, constructed-response recall items—which better enable us to examine students' reasoning skills—in a single assessment. Also, we must keep in mind that our assessments don't need to be entirely verbal in nature; they can also include visual materials, as the example in Figure 14.9 does.

Figure 14.9 Using the map shown here, explain why early people living in Russia, China, and India developed distinctly different languages and cultures.



- *When assessing basic knowledge, rephrase ideas presented in class or reading materials.* If we want to encourage meaningful rather than rote learning as students prepare for a formal assessment, we must—let's repeat that, we *must*—create items for which word-for-word memorization is counterproductive. Consider, for example, a middle school language arts teacher who uses short multiple-choice quizzes to assess students' understanding of each week's new vocabulary words. Quiz items should never include the exact definitions students have been given. Maybe students have been given this definition for *covet:* "To long for or crave something." A question might look like this:

> Which one of the following words or phrases is closest in meaning to the word *covet?*
> a. cook
> b. wish
> c. hide
> d. ponder
> (*The correct answer is* b.)

To assess complex cognitive processes, ask students to apply what they've learned to new situations. When we present situations or problems that students have previously studied, students may respond correctly simply because they've memorized the answers. We can genuinely assess problem solving, critical thinking, and other complex cognitive processes only when we ask students to use their knowledge and skills in new contexts—that is, when they must *transfer* what they've learned. For example, we might ask students to:

- Critique the conclusions a researcher draws from a research study
- Identify a writer's underlying assumptions in arguing for a particular perspective
- Assess the credibility of information presented on a website (Nitko & Brookhart, 2011)

Although constructed-response tasks are typically better suited for assessing transfer, with thought and creativity we can even create recognition items that assess transfer. The following multiple-choice question for a science unit on simple machines is an example:

> An inventor has just designed a new device for cutting paper. Which one of the following simple machines is this device most likely to include?
> a. A lever
> b. A movable pulley
> c. An inclined plane
> d. A wedge
> (*The correct answer is* d.)

Define tasks clearly and unambiguously. Regardless of whether students know how to correctly respond to assessment tasks, they should at least understand what we're asking them to do. The next exercise can show you what we mean.

Experiencing Firsthand

Assessing Your Knowledge of Assessment

Your educational psychology instructor gives you a test that includes these questions:

1. List four qualities of a good classroom assessment.
2. Summarize the purposes of classroom assessment.

Take a few minutes to think about how you might answer each question. Jot down your thoughts about what you would include in your responses.

Was your answer to Question 1 as simple as "reliability, standardization, validity, and practicality"? Did you think you needed to explain each of the RSVP characteristics? Did you identify legitimate qualities of "goodness" other than the four RSVP characteristics? And what about Question 2? What purposes did you focus on, and how long do you think your actual summary might be? Words such as *list, qualities,* and *summarize* are hard to interpret and can be misleading.

Provide guidance and structure for students' responses. To some degree, we should do this by clearly defining the assessment task. For example, to assess students' knowledge of 18th-century American history, rather than ask them only to "List three causes of the American Revolution," we might instead ask them to do this:

> Identify three policies or events during the 1760s and/or 1770s that contributed to the outbreak of the American Revolution. For each one, explain in three to five sentences how it increased tension between England and the American colonies.

Alternatively, to assess students' ability to separate and control variables, we might give them a question such as this one:

> A physics student wants to study the rate at which a ball rolls down an inclined plane. The student wonders whether either the slope of the plane or the weight of the ball affects this rate. Describe an experiment the student could conduct. Be sure to include (a) the materials the student should use in the experiment, (b) at least two hypotheses the student might make, and (c) the steps the students should take to test the hypotheses. (Based on a general structure suggested by Johnson et al., 2009)

Such clarity and structure are especially important when a *lot* of information might potentially be relevant to a constructed-response task. Otherwise, students' responses can go in so many different directions that scoring them consistently and reliably is virtually impossible.

Minimize the likelihood that students can guess correctly when they don't know the answer. Assessment tasks have content validity only to the extent that they can help us accurately determine whether students have mastered the knowledge and skills being assessed. Poorly written items sometimes provide logical clues that enable even uninformed students to answer correctly.

Experiencing Firsthand

Califractions

Imagine that you're enrolled in Professor Carberry's psychoceramics course. Early in the semester, before you've had a chance to read the assigned chapter, Professor Carberry gives a surprise quiz on califractions. Below are the first two quiz items; there's only one correct answer for each one:

1. Because they are furstier than other califractions, califors are most often used to
   a. reassignment of matherugs
   b. disbobble a fwing
   c. mangelation
   d. in the burfews
2. Calendation is a process of
   a. combining two califors
   b. adding two califors together
   c. joining two califors
   d. taking two califors apart

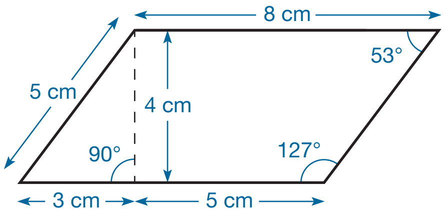
Construct items that can help you determine whether certain misconceptions persist.

You could possibly answer both questions without knowing anything about califractions. Because Item 1 says "califors are most often used to . . .," the answer must begin with a verb and so must be Alternative *b* (Alternatives *a* and *c* begin with nouns—"reassign*ment*" and "mangela*tion*"—and *d* begins with a preposition). Item 2 includes three similar-meaning alternatives (*a, b, c*); because the item can have only one right answer, the correct choice must be *d*.

In constructing multiple-choice items and other recognition tasks, we should take care that all alternatives are equally logical choices in two respects: (a) They're grammatically parallel to one another and consistent with the stem and (b) only one of them is legitimately correct. Hence many experts recommend that we *not* use "all of the above" as an option in a multiple-choice question: If this is the correct answer (and it often is in teacher-written tests), the other alternatives must be correct as well, and students who have been told to choose the "correct" answer might be confused. A better strategy is to use one or more common misconceptions as distractors, as the following item about the causes of the seasons does:

> What is the *main* reason that it's colder in winter than in summer?
> a. Because the Earth is in the part of its orbit farthest away from the sun
> b. Because the snow on the ground reflects rather than absorbs the sun's heat
> c. Because the sun's rays hit our part of the earth at more of an angle
> d. Because wind is more likely to come from one of the poles than from the Equator
> (*The correct answer is* c. *Alternative* a *is a common misconception*.)

Another strategy for minimizing correct guesses—one that's especially useful in constructed-response tasks—is to include information that's irrelevant to the answer. For example, at some point in your schooling you almost certainly learned how to calculate the area of a parallelogram. If you did, can you quickly calculate the area of the parallelogram shown in the margin?



If you can recall the formula (Area = Base × Height), you should easily arrive at the answer (8 × 4, or 32 square cm). But if you've forgotten the procedure, you might be led astray by some of the information the figure provides. An additional advantage of including extraneous information is that it often enhances the real-life nature of an assessment task. The outside world typically presents a lot of information that has little or nothing to do with the task at hand, and students must ultimately be able to determine what information they actually need.

- *Consider giving students access to reference materials.* In some cases we may want students to have only one resource—long-term memory—as they complete an assessment. But in other cases it may be appropriate to let them use reference materials as they work—perhaps a dictionary, map, article, a list of formulae, or class notes. An assessment task in which reference materials are allowed is especially appropriate when our objective is for students to find, analyze, or apply information rather than memorize it. For example, one of us authors taught introductory statistics for many years; rather than asking students to memorize formulas, the students were provided with the formulas during exams, so that they could focus on applying the formulas, rather than memorizing them.
- *Place shorter and easier items before more challenging ones.* Some students approach assessments strategically, answering quick and easy items first, regardless of the order in which the items are sequenced. But other students tend to address items in the order they appear, sometimes spending so much time on one item (e.g., a lengthy essay) that they leave little time to tackle other, shorter ones. By beginning an assessment with short, relatively easy items, we can both (a) minimize students' anxiety and (b) ensure that they demonstrate some of what they've learned before they get bogged down in especially challenging tasks.
- *Identify scoring criteria in advance.* We should identify correct responses—or at least the components of a good response—at the same time we develop our assessment tasks. To the extent that students' responses will require some professional judgment on our part, we might develop one or more checklists or rubrics to guide our scoring and to ensure that we are assessing student work consistently. We should also develop policies about what to do when students give partially correct answers, respond correctly but include additional *in*correct information, or write responses with numerous grammatical and spelling errors (more about the last of these issues shortly).

- *Consider using an electronic alternative to written assessments.* Some online resources and software enable us to create, administer, and score what have traditionally been written assessment instruments. An example is Quia (www.quia.com/web), where we can create tests and quizzes using a variety of traditional item formats (e.g., multiple-choice, true–false, short answer) and, if we like, include graphics or audio messages in one or more items. Students take an assessment on a computer or tablet and get immediate feedback; the website also records students' scores in a class database for us. In using resources such as Quia, we must of course, remember that they're limited largely to assessment tasks with clear-cut right and wrong responses, and they may not be suitable for students who have limited technological literacy or for some other reason find technology intimidating.

Administering Formal Classroom Assessments The validity of our formal classroom assessment instruments depends not only on how we construct them but also on how we administer them. Following are three general strategies that should increase the validity of our results when we administer a formal assessment.

- *Provide a quiet and comfortable environment.* Students are more likely to perform at their best when they have adequate lighting, reasonable work space, and minimal distractions. Such factors may be especially important for students who are easily distracted, unaccustomed to formal assessments, or uninterested in exerting much effort—for instance, students who are at risk for academic failure and dropping out of school (Popham, 2006; Shriner & Spicuzza, 1995).
- *Encourage students to ask questions when tasks aren't clear.* We should encourage students to seek clarification whenever they're uncertain about what we're asking them to do. Without such encouragement, some students may be reluctant to ask questions during formal assessments (Grant & Gomez, 2001; Karabenick & Gonida, 2018; Li & Fischer, 2004).
- *Take reasonable steps to discourage cheating.* For a variety of reasons, the prevalence of cheating increases as students get older. Some students may be more interested in doing well on an assessment than in actually learning the subject matter; for them, performance goals predominate over mastery goals. Others may believe that teachers' or parents' expectations for their performance are unattainably high and that success is impossible unless they cheat. In addition, students may perceive certain assessments to be poorly constructed, arbitrarily graded, or in some other way a poor reflection of what they've learned. Often, too, peers may communicate through words or actions that cheating is quite acceptable (Anderman & Koenka, 2017; Anderman et al., 2007; Cizek, 2003; Danner, 2008; Lenski et al., 2010; Murdock et al., 2004).

  When students cheat, their assessment scores don't accurately reflect what they know and can do—hence, the scores have little or no validity. Furthermore, cheating can be habit forming if students discover that it enables them to get good grades with minimal effort (Cizek, 2003). The best approach is prevention—making sure students don't cheat in the first place—through strategies such as these:

In the Weeks or Days Before the Assessment

- Focus students' attention on mastery goals rather than performance goals or extrinsic outcomes (e.g., test scores).
- Prepare students so that success without cheating is a realistic possibility.
- Use assessment instruments that ascertain whether students have learned the material that was emphasized during instruction.
- Create two or more instruments that are equivalent in form and content but have different answers (e.g., arrange the same set of multiple-choice questions in two different orders).

- Explain exactly what cheating is and why it's unacceptable; for instance, explain that cheating includes plagiarism, such as copying material word for word from the internet without giving appropriate credit.
- Describe the consequence that will be imposed for cheating.

During the Assessment

- Insist that smartphones and other electronic devices (e.g., smart watches) be turned off and checked in at the classroom door.
- Assign seats during any assessments that require individual work rather than small-group work.
- Remain attentive to what students are doing throughout the assessment session, but without hovering over particular students.

Unfortunately, digital technologies now enable students to cheat in ways that weren't possible several decades ago. During quizzes, some ill-prepared students may try to communicate electronically to share answers (note the preceding recommendation about checking smartphones at the door). And when assignments require independent research in an unsupervised setting, a few students might try to pass off documents obtained on the internet as being their own work. As teachers ourselves, we authors have found two strategies to be helpful in minimizing internet-based plagiarism. First, we've designed assessment tasks that are so specific—and so tied to particular instructional goals—that documents found on the internet don't meet the task requirements. Second, we've been vigilant for clues that point to questionable authorship—for example, sophisticated knowledge, vocabulary, and sentence structures that we don't typically see in our students' work. There also are some databases (e.g., www.turnitin.com) that can be used to assess students' written prose for plagiarism.

If, despite reasonable precautions, cheating occurs, we must administer whatever consequence we've previously described. The consequence should be severe enough to discourage a student from cheating again, yet not so severe that the student's motivation and chances for academic success are affected over the long run. Having the student honestly redo the task is one appropriate consequence; we might also ask the student to write a paper about the moral implications and negative repercussions of academic dishonesty (O'Connor, 2011). In general, we must remember that students' final grades should ultimately reflect *what they have learned*.

Identify an appropriate consequence for cheating, one severe enough to discourage cheating yet not so severe that it undermines students' motivation and long-term success. Alert students to this consequence and administer it consistently when cheating occurs.

Scoring Students' Responses to Formal Classroom Assessments As we evaluate performance on an assessment task, we must continue to be concerned about the four RSVP characteristics. Also, we must keep in mind that our most important goal isn't to evaluate students but rather to *help students learn*. Each of the following strategies is valuable in achieving one or both of these ends.

- *Strive for objectivity.* Some assessment tasks have clear right and wrong answers, but others (e.g., essays and lab reports) can require teacher judgments regarding quality. Whenever scoring involves considerable decision making, a scoring checklist or rubric can help us be reasonably objective and consistent in our evaluations. To be maximally useful, a rubric includes concrete descriptions of various levels of proficiency—rather than a simple rating scale of, say, "Poor" to "Excellent"—and perhaps also includes examples of student work that illustrate each level. Many online learning management systems now include the option of building a rubric so that these types of assignments can be assessed by teachers online, with consistency.
- *To the extent possible, score grammar and spelling separately from the content of students' responses unless specifically assessing writing skills.* This recommendation is especially important when assessing students with limited writing skills, such as English language learners and students with disabilities (Hamp-Lyons, 1992; Scarcella, 1990; Valdés et al., 2005).

- *Before beginning to score, skim a few students' responses, looking for unanticipated responses and revising the criteria if necessary.* As a general rule, we should use the criteria we've previously told students we'll use. Occasionally, however, we may need to adjust one or more criteria—or perhaps add or subtract one or two criteria—to accommodate unexpected responses and enhance our ability to score all responses consistently, fairly, and reliably.
- *Score item by item rather than paper by paper.* When scoring involves subjective decision making, we can score students' responses more reliably if we score them item by item—scoring all responses to the first question, then all responses to the second question, and so on.
- *Try not to let prior expectations for students' performance influence judgments of their actual performance.* The halo and horns effects described earlier can come into play in formal assessments as well as informal ones. The more variable and complex students' responses are, the greater the difficulty we'll have in scoring responses objectively and reliably. Strategies such as shuffling papers after grading one question and using small self-stick notes to cover up students' names can help us prevent our expectations from inappropriately influencing our judgments.
- *Accompany any overall scores with specific feedback.* We must always keep in mind that all of our assessments—including our summative ones—can and should enhance students' *future* achievement. Accordingly, we should provide detailed comments that tell students what they've done well, where their weaknesses lie, and how they can improve. It's particularly important to empower our students to improve, because simply giving them feedback without guidance about how to use the feedback may not lead to them using that feedback to change their learning strategies (Winstone et al., 2017). When students get only a single score or grade on an assessment, without an accompanying explanation of *why* their performance was evaluated as it was, they're likely to attribute the evaluation to something beyond their control—perhaps to their own innate ability or *in*ability, or perhaps to highly subjective and arbitrary teacher judgments—which will lead them to work toward performance goals rather than mastery goals (Stupnisky et al., 2011).

RSVP Characteristics of Formal Classroom Assessments How do formal classroom assessments measure up in terms of the four RSVP characteristics? Let's consider each characteristic in turn.

Reliability. When classroom assessments have definite right and wrong answers, we can usually evaluate responses with a high degree of consistency. In contrast, when we must make subjective judgments about the relative rightness or wrongness of students' responses, reliability inevitably goes down a bit.

Standardization. As a general rule, teacher-developed assessment instruments are easily standardized. We can give all students similar tasks and instructions, provide similar time limits and test-taking conditions, and score everyone's responses in essentially the same way. Yet we must balance the need for standardization against other considerations. For example, we may need to tailor assessment tasks to the particular abilities and disabilities of students with special needs. When assessing students' writing skills, we might sometimes let students choose a writing topic, perhaps as a way of increasing their sense of autonomy.

Standardize formal classroom assessments as much as possible, but make appropriate accommodations for students with disabilities.

Validity. When we ask questions that require only short, simple responses, we can sample students' knowledge about many topics within a short time period. In this sense, then, such questions can give us greater content validity. Yet such items won't always reflect our instructional goals. To assess students' ability to apply what they've learned to new situations and complex real-world problems, we may need to be satisfied with a few tasks requiring lengthy responses, even if those tasks provide a somewhat limited sample of the content domain.

Practicality. Written or technology-delivered formal assessments are typically more practical than performance assessment; for example, we can assess all students at the same time, and in many cases we can score students' responses in a short time. Thus formal classroom assessments should be our method of choice *if* they can yield a valid measure of what students know and can do. But when such tasks aren't a good reflection of what students have learned, we may need to sacrifice practicality to gain the greater validity that a performance assessment provides.

Using Performance Assessments

A wide variety of performance tasks can be used to assess students' mastery of classroom subject matter. Here are just a few of the many possibilities:

- Playing a musical instrument
- Conversing in a foreign language
- Engaging in a debate about social issues
- Fixing a malfunctioning machine
- Role-playing a job interview
- Presenting research findings to a group of peers

Performance assessment lends itself especially well to the assessment of complex achievements, such as those that involve simultaneous use of multiple skills. It can also be quite helpful in assessing such complex cognitive processes as problem solving, creativity, and critical thinking. Furthermore, performance tasks are often more meaningful, thought provoking, and authentic—and thus often more motivating—than written assessments (Darling-Hammond et al., 1995; DiMartino & Castaneda, 2007; Johnson et al., 2009; Khattri & Sweet, 1996; Paris & Paris, 2001).

Choosing Appropriate Performance Tasks As is true for any assessment, our selection of appropriate performance assessment tasks must be closely aligned with our instructional goals and objectives. We must also consider whether a particular task will enable us to make reasonable generalizations about what our students know and can do in the content domain in question. Following are three distinctions that can help us zero in on the most appropriate tasks for our purposes.

Products versus processes. Some performance assessments focus on tangible *products* that students create—perhaps a drawing or a poster. Others focus on the specific *processes and behaviors* that students exhibit—perhaps giving an oral presentation, demonstrating how to dribble a basketball, or playing an instrumental solo. Sometimes we might be interested in students' *thinking* processes. For example, if we want to determine whether students have acquired certain logical thinking abilities (e.g., conservation, separation, and control of variables), we might present tasks similar to those Jean Piaget used and, through a series of probing questions, ask students to explain their reasoning. We also can often learn a great deal about how students conceptualize and reason about scientific phenomena when we ask them to manipulate physical objects (e.g., electrical circuits in a physics class), make predictions about what will happen under varying circumstances, and explain their results (Baxter et al., 1996; diSessa, 2007; Magnusson et al., 1994; Quellmalz & Hoskyn, 1997).

Individual versus group performance. Many performance tasks require *individual* students to complete them with little or no assistance. Other tasks are sufficiently complex that they're best accomplished by a *group* of students. For instance, in high school social studies, we might assess students' mastery of certain concepts and skills by using a field-based cooperative group project like the one shown in Figure 14.10. Tasks such as these require students to collect data systematically, use the data to draw conclusions

Figure 14.10 Example of a group-based performance assessment task in a high school social studies class.

1. Use a map of your city or town to choose a 6- to 8-block neighborhood near your school.
2. Use both field studies and Google Earth to identify your neighborhood's types of housing, businesses, and public spaces and services (e.g., parks, schools, health care facilities). Also identify common modes of transportation, such as walking, bicycling, driving privately owned vehicles, and use of public transportation systems (e.g., buses, subways).
3. Conduct interviews with at least five residents and/or business owners in the neighborhood, asking them what things they think are "good" and "bad" about the neighborhood.
4. Using the information you have gathered in Steps 2 and 3, identify problems this neighborhood appears to have. For example, are buildings or roads in disrepair or in some other way unsafe? Do people have trouble getting from this neighborhood to other parts of your city or town? Are crime rates high?
5. As a cooperative group, write a report that both (a) describes your findings and (b) makes at least three recommendations for improving your neighborhood.

and make predictions, and, in general, think as local government officials and urban planners might think (Newmann, 1997).

One challenge in using group tasks for assessment purposes is determining how to evaluate each student's contribution. Often teachers consider individual students' behaviors and achievements—for instance, what and how much a student contributes to the group effort and how much the student has learned by the end of the project—in addition to or instead of the entire group's accomplishments (Lester et al., 1997; Stiggins & Chappuis, 2012).

Restricted versus extended performance. Some performance tasks are quite short; that is, they involve *restricted performance*. For instance, we might ask each student in a beginning instrumental music class to play a single major scale in brief, one-on-one sessions with us.

We assess *extended performance* when we want to determine what students are capable of doing over several days or weeks. Extended performance tasks might provide opportunities for students to collect data, engage in collaborative problem solving, and edit and revise their work. Many extended performance tasks embody authentic assessment: They closely resemble the situations and problems that students might eventually encounter in the outside world. Because extended performance tasks take a great deal of time, we should use them primarily for assessing achievement related to our most important and central instructional goals (Lester et al., 1997; Wiggins & McTighe, 2007).

Planning and Administering a Performance Assessment Many of the guidelines presented earlier for written classroom assessments are equally relevant to performance assessment. The following are especially important to keep in mind:

- Define tasks clearly and unambiguously.
- Inform students in advance that there will be a performance assessment, particularly if they are not accustomed to being assessed in this manner.
- Identify detailed scoring criteria in advance.
- Encourage students to ask questions when tasks aren't clear.

Three additional guidelines pertain primarily to performance assessments:

- *Consider incorporating the assessment into normal instructional activities.* We can sometimes make more efficient use of class time if we combine instruction and assessment into a single activity (Baxter et al., 1996; Baxter et al., 1996; Boschee & Baron, 1993). For example, in a unit on bar graphs, a first-grade teacher gave each of her students a two-dimensional grid with the months of the year written in the leftmost column. She instructed students to write their own name in a box beside their birthday month and then to circulate around the room to get each classmate's signature in a box in the appropriate row. Ideally, this procedure would yield a horizontal bar graph depicting the number of children born in each month.

When using a performance assessment for summative assessment, keep the assessment separate from instruction.

When we incorporate performance assessments into instructional activities, we must keep in mind that we won't be able to completely standardize conditions for all students, and we won't necessarily see students' best work. Furthermore, although it's quite appropriate to give students assistance or feedback during instruction, it may be *in*appropriate to do so during a summative assessment of what they've achieved. In some situations, then, we may want to conduct an assessment separately from instructional activities, announce it in advance, and give students guidance beforehand about how they can maximize their performance.

- *Provide some structure to guide students' efforts, but not so much structure that it reduces the authenticity of the task.* Especially if we're conducting a summative assessment, we should probably structure performance assessments to some degree. For example, we can provide detailed directions about what students should accomplish, what materials and equipment they can use, and how much time they have to get the job done (Gronlund & Waugh, 2009; Hiebert et al., 1994). Such structure helps to standardize the assessment and thus enables us to evaluate students' performance more reliably.

  A *lot* of structure can decrease the validity of a performance task, however. Imposing a great deal of structure is particularly problematic when we intend performance tasks to be authentic ones that resemble real-world situations—which often *don't* have much structure.

Chapter 12 presents guidelines for effective classroom management.

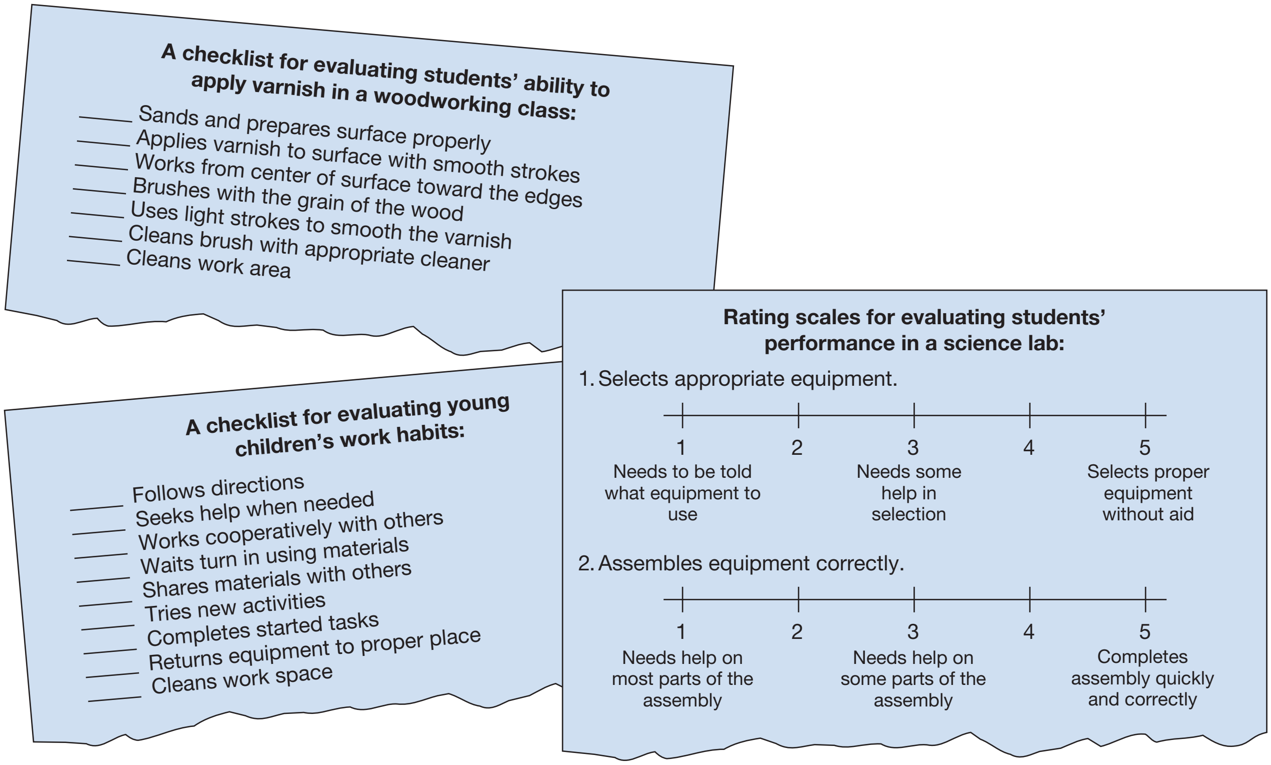
- *Plan classroom management strategies for the assessment activity.* As we conduct a performance assessment, we should put into practice two important principles of classroom management: Effective teachers are continually aware of what their students are doing (the notion of *withitness*), and they make sure that students are always productively engaged. When we can assess students' performance only individually or in small groups, we must make sure that other students are actively involved in a learning activity (Carey, 1994). For example, in a unit on soccer, when a few students are demonstrating their ability to dribble and pass the ball as they run down the field, we might have other students work in pairs to practice their footwork.

Scoring Students' Responses in a Performance Assessment Occasionally responses to performance assessment tasks are objectively scorable; for instance, we can easily time students' performance in a 100-meter dash and count students' errors on a typing test. But more often we'll find ourselves making subjective decisions as we assess performance. Research suggests that observations of student performance on various tasks sometimes varies greatly, depending on who is doing the observing (i.e., reliability may be a concern if different observers arrive at different conclusions about student performance) (Styck et al., 2021). There are no clear-cut right or wrong responses when students give oral reports, create clay sculptures, or engage in heated debates on controversial issues. Consequently, if we aren't careful, our judgments may be unduly influenced by our expectations for each student.

Especially for summative performance assessments, we should create some sort of structured recording form that can guide us during the assessment process and later serve as a written record of what we've observed. The next four recommendations can help us design recording forms that should ensure reasonable validity and reliability in a performance assessment.

- *When using several criteria to evaluate students' performance, describe each criterion in concrete terms, and develop a checklist or rubric to guide scoring.* Some performance tasks lend themselves well to checklists, whereas others are more effectively evaluated with rubrics. Figure 14.11 shows three simple examples. The two on the left, one for using varnish and the other for general work habits, are obviously checklists. The one on the right includes two simple rubric-like **rating scales** for evaluating the quality of students' performance in a science lab—that is, it assigns numbers to various points on two continua of quality. Both of these approaches can enhance the reliability of scoring and have instructional benefits as well: They identify specific areas of difficulty and thereby give students feedback about how performance can be improved.
- *Decide whether analytic or holistic scoring better serves your purpose(s) in conducting the assessment.* When we need detailed information about students' performance, we may want to use **analytic scoring**, in which we evaluate various aspects of the performance separately, perhaps with a checklist or several rating scales. In contrast, when we need to summarize students' performance in a single score, we should probably use **holistic scoring**, in which we consider all relevant criteria but make a single judgment; for instance, we might have a single rating scale of "1" to "5" or "Poor" to "Proficient," along with concrete descriptions of what a student's performance along each point of the continuum looks like. Analytic scoring tends to be more useful in conducting formative assessments and promoting students' learning, whereas holistic scoring is often used in final, summative assessments.

Figure 14.11 Examples of task-specific scoring guides.



A checklist for evaluating students' ability to apply varnish in a woodworking class:

_____ Sands and prepares surface properly
_____ Applies varnish to surface with smooth strokes
_____ Works from center of surface toward the edges
_____ Brushes with the grain of the wood
_____ Uses light strokes to smooth the varnish
_____ Cleans brush with appropriate cleaner
_____ Cleans work area

A checklist for evaluating young children's work habits:

_____ Follows directions
_____ Seeks help when needed
_____ Works cooperatively with others
_____ Waits turn in using materials
_____ Shares materials with others
_____ Tries new activities
_____ Completes started tasks
_____ Returns equipment to proper place
_____ Cleans work space

Rating scales for evaluating students' performance in a science lab:

1. Selects appropriate equipment.

1	2	3	4	5
Needs to be told what equipment to use		Needs some help in selection		Selects proper equipment without aid

2. Assembles equipment correctly.

1	2	3	4	5
Needs help on most parts of the assembly		Needs help on some parts of the assembly		Completes assembly quickly and correctly

SOURCES: Checklists from *Measurement and Assessment in Teaching*, 9th edition, by Robert L. Linn and M. David Miller. Copyright © 2005 by Pearson Education, Inc. Printed and electronically reproduced by permission of Pearson Education, Inc. Upper Saddle River, New Jersey. Scales from *Writing Instructional Objectives for Teaching and Assessment*, 7th edition, by Norman E. Gronlund. Copyright © 2011 by Pearson Education, Inc. Printed and electronically reproduced by permission of Pearson Education, Inc. Upper Saddle River, New Jersey.

- *Limit scoring criteria to the most important aspects of the desired response.* Scoring criteria should focus on aspects of the performance that are critical indicators of proficiency and most relevant to instructional goals and objectives (Miller et al., 2009; Wiggins, 1992). The criteria should also be relatively few in number (perhaps five or six) so that we can keep track of them as we observe each student's performance (Gronlund & Waugh, 2009; Popham, 2014). Remember the limited capacity of working memory: Humans—including teachers!—can think about only a certain number of things at a single time.
- *Make note of any significant aspects of a student's performance that the scoring guide doesn't address.* Whenever we break down performance on a complex task into discrete behaviors, we can lose valuable information along the way (Delandshere & Petrosky, 1998). As we use scoring guides to assess students' achievement, we may occasionally want to jot down other noteworthy characteristics of their performance. This aspect of our scoring process will be neither standardized nor reliable, of course, but it can sometimes be useful in identifying students' unique strengths and needs and can therefore assist us in future instructional planning.

RSVP Characteristics of Performance Assessments Compared with traditional written assessments, many performance assessment techniques are relatively new, and educators continue to wrestle with concerns related to reliability, standardization, validity, and practicality.

Reliability. Researchers have reported varying degrees of reliability in performance assessments. Assessment results are often inconsistent over time, and different teachers may rate the same performance differently (Crehan, 2001; Hay, 2008; Haywood & Lidz, 2007; Johnson et al., 2009).

There are probably several reasons for the low reliability of many performance assessments. First, students don't always behave consistently; even in a task as simple as shooting a basketball, a student is likely to make a basket on some occasions but not on others. Second, we sometimes need to evaluate various aspects of complex behaviors rather quickly; things may happen so fast that we miss important parts of a student's performance. Finally, one form of reliability—*internal consistency*—is largely irrelevant when we're assessing complex, multifaceted behaviors (Carey, 1994; Parkes, 2001; Wiley & Haertel, 1996).

Remember that a single performance assessment may not be a standardized or reliable indicator of what students have achieved.

Given these limitations, a single performance assessment may very well *not* be a reliable indicator of what students have achieved. Accordingly, we should ask students to demonstrate behaviors related to important instructional goals on more than one occasion. And when an important summative assessment is involved, we should ideally have more than one rater evaluate each student's performance (Johnson et al., 2009; Miller et al., 2009).

Standardization. Some performance assessments are easily standardized, but others are not. If we want to assess students' keyboarding speed and accuracy, we can easily make instructions, tasks, and time limits the same for everyone. In contrast, if we want to assess artistic creativity, we may want to let students choose the materials they use and the particular products they create. In such non-standardized situations, it's especially important to use multiple assessments and look for consistency in students' performance across several occasions.

Validity. As previously noted, performance assessment tasks can sometimes provide more valid indicators of what students have accomplished relative to instructional goals. However, students' responses to a *single* performance assessment task often are *not* a good indication of their overall achievement. Content validity is the issue here: If we have time for students to perform only one or two complex tasks, we may not get a representative sample of what they've learned and can do. In addition, any biases that affect our judgment (e.g., beliefs about particular students' abilities) can distort our assessments of students' performance—the halo and horns effects at work once again. To ensure that our conclusions are reasonably valid, then, we'll typically want to administer several different performance tasks, perhaps on two or more occasions (Klassen, 2006; Linn, 1994; Parkes, 2001; Stiggins & Chappuis, 2012).

Remember that a single performance task may not provide a sufficiently representative sample of the content domain.

Practicality. Performance assessments are often less practical than more traditional assessments. Administering an assessment can be quite time consuming, especially when we must observe students one at a time or when they must perform relatively complex (perhaps authentic) tasks. In addition, we may need considerable equipment to conduct the assessment. Clearly, then, we must carefully consider whether the benefits of a performance assessment outweigh its impracticality. Ultimately the best strategy overall may be to use *both* traditional classroom assessments and performance assessments when drawing conclusions about students' achievement.

Think about how you might use a combination of written classroom assessments and performance tasks to evaluate what students know and can do.

Table 14.5 presents a summary of our RSVP analyses of informal assessment, formal written assessment, and formal performance assessment.

Additional Considerations in Assessment

In our discussion of formal assessment so far, our focus has been on the design, administration, and scoring of particular assessment tasks. We now step back and look at more general issues related to formal assessment.

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Table 14.5 Evaluating RSVP Characteristics of Different Kinds of Summative Assessment

Kind of Assessment	Reliability	Standardization	Validity	Practicality
Informal assessment	A single, brief assessment is not a reliable indicator of achievement. We must look for consistency in a student's performance across time and contexts.	Informal observations are rarely, if ever, standardized. Thus, we should not compare one student to another based on informal assessment alone.	Students' public behaviors in the classroom aren't always valid indicators of their achievement (e.g., some students may try to hide high achievement from their peers).	Informal assessment is definitely practical: It's flexible and can occur spontaneously during instruction.
Formal written assessment	Objectively scorable items are highly reliable. We can enhance the reliability of subjectively scorable items by specifying scoring criteria in concrete terms.	In most instances, formal written assessment instruments are easily standardized. Giving students choices (e.g., regarding topics to write about or questions to answer) may increase motivation but reduce standardization.	Numerous questions requiring short, simple responses can provide a more representative sample of the content. But tasks requiring lengthy responses may sometimes more closely match instructional goals.	Formal written assessment is usually practical: All students can be assessed at once, and no special materials are required.
Formal performance assessment	Performance assessment tasks are often difficult to score reliably. We can enhance reliability by specifying scoring criteria in concrete terms (e.g., with a checklist or rubric).	Some performance assessment tasks are easily standardized, whereas others are not.	Performance tasks may sometimes be more consistent with instructional goals than are written assessments. However, a single performance task may not provide a representative sample of the content; several tasks may be necessary to ensure adequate content validity.	Performance assessment is typically less practical than other approaches: It may involve special materials, and it can take a fair amount of class time, especially if students must be assessed one by one.

Teaching Testwiseness If you did well on the califractions quiz earlier in the chapter, you have some degree of **testwiseness**: You use test-taking strategies that enhance your test performance. Testwiseness includes strategies such as these:

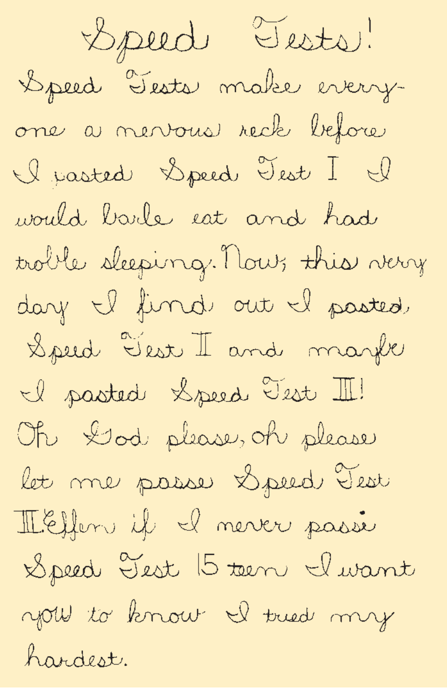
- *Pinning down the task(s) to be performed*—for example, carefully reading the directions and every question
- *Using time efficiently*—for example, allocating enough time for each task and saving difficult items for last
- *Deductive reasoning*—for example, eliminating two alternatives that say the same thing and using information from one question to answer another
- *Avoiding sloppy errors*—for example, checking answers a second time and erasing stray pencil marks on a digitally scanned answer sheet
- *Guessing strategically*—for example, eliminating obviously wrong alternatives and then guessing one of the others, or guessing randomly if time runs out and there's no penalty for guessing (Hong et al., 2006; Millman et al., 1965; Shepard et al., 2005)

Give students practice in responding to unfamiliar test-item formats. Teach test-taking strategies, but not at the expense of shortchanging instruction in the knowledge and skills being assessed.

Certain aspects of testwiseness, such as guessing strategically and erasing stray pencil marks, are applicable primarily to written recognition items (e.g., multiple-choice questions). But others, such as clarifying assigned tasks and carefully managing time, can make a difference in virtually any kind of formal assessment.

As teachers, we must remember that many students—especially younger ones and those whose prior schooling has been in a different culture—may need explicit instruction in common item formats and useful test-taking strategies. At the same time, we should keep in mind that testwiseness typically has only a small impact on students' assessment scores. Furthermore, test-taking skills and student achievement are positively correlated: Students with many test-taking strategies tend to be higher achievers than students with few strategies. In other words, very few students get low test scores *only* because they're poor test takers. In most cases, then, we can best serve students by teaching them the knowledge and skills a given assessment is designed to measure, rather than spending an inordinate amount of time teaching them how to take tests (Frederiksen & Collins, 1989; Geiger, 1997; Scruggs & Lifson, 1985; Shepard et al., 2005).

Figure 14.12 In this reflection on "Speed Tests"—those in which many questions must be answered in a very short time—8-year-old Connie describes how overwhelming test anxiety can be.


Speed Tests!
Speed Tests make every-
one a nervous reck before
I pasted Speed Test I I
would barle eat and had
troble sleeping. Now; this very
day I find out I pasted,
Speed Test II and maybe
I pasted Speed Test III!
Oh God please, oh please
let me passe Speed Test
III. Effen if I never passi
Speed Test 15 teen I want
you to know I tried my
hardest.

Kevin Davis

Keeping Test Anxiety in Check A small amount of anxiety about tests and other important assessments can enhance performance. But some students become extremely anxious in assessment situations—they have **test anxiety**—to the point that their scores significantly underestimate what they've learned (for example, see Figure 14.12). Such students appear to be concerned primarily about the *evaluative* aspect of assessments, worrying that someone will find them to be "stupid" or in other ways inadequate. Test anxiety interferes not only with retrieval and performance at the time of an assessment, but also with encoding and storage when learners are preparing for the assessment. Thus, highly test-anxious students don't just *test* poorly; they also *learn* poorly (Cassady, 2010; Zeidner & Matthews, 2005).

Excessive, debilitating test anxiety is especially common in some ethnically diverse students and in students with disabilities (Carter et al., 2008; Putwain, 2007; Whitaker Sena et al., 2007). Generally, students with the highest test anxiety are those who have performed poorly in school in the past. One important strategy for helping students overcome test anxiety is to help them acquire the skills they need to master course material in the first place, including good study strategies and self-regulation skills. In addition, we must present classroom assessments in ways that motivate students to do their best without succumbing to debilitating anxiety. One middle school student, Jamaal, explained how his math teacher helped to keep his anxiety about assessments in check:

Net Vector/Shutterstock

Minimize test anxiety by helping students master academic subject matter.

> Ms. Wheeler doesn't call it a test. She says, "It's a quiz, it's a worksheet, it's whatever you want it to be. Just make sure you do your best. It's a puzzle, it's a game. Just do your best." And [on] most tests she doesn't even put the word "Test" on it, or she doesn't tell us it's a test. It takes the pressure off so you can think about what you're doing more. (Usher, 2009, p. 303)

Table 14.6 presents some *dos* and *don'ts* for keeping students' test anxiety at productive levels.

Encouraging Academic Risk Taking Only when students feel free to take risks and make mistakes will they tackle the challenging tasks that can maximize their learning and cognitive development. We encourage risk-taking—and lower students' anxiety levels as well—when our assessment strategies give students some leeway to be wrong without penalty (Clifford, 1990; McMillan, 2010). Certainly, no single assessment should ever be "sudden death" for a student who earns a low score. Following are three recommended strategies for encouraging risk-taking during classroom assessments.

- *Assess students' achievement frequently rather than infrequently.* Regular assessments are, of course, a key means by which we and our students can track students' progress and address areas of weakness needing attention. But frequent assessments—rather than infrequent ones—have several additional benefits. First, students are less likely to experience debilitating anxiety if they complete a number of assessments that each contribute only a small amount to their final grades. Second, frequent assessments motivate students—especially those with lower achievement—to study regularly. Third, when students no longer feel pressure to perform well on every quiz and assignment, they're less likely to cheat in order to get good grades. Finally and most importantly, students who are assessed frequently achieve at higher levels than students who are assessed infrequently (Anderman & Koenka, 2017; Crooks, 1988; Glover, 1989; McDaniel et al., 2011; Roediger & Karpicke, 2006; Rohrer & Pashler, 2010; Sax, 2010).
- *Provide opportunities to correct errors.* Especially when an assessment includes most or all of the content domain in question, students can often increase their

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Table 14.6 Keeping Students' Anxiety at a Facilitative Level During Classroom Assessments

What to Do	What Not to Do
Point out the value of the assessment as a feedback mechanism to improve learning.	Don't stress the fact that students' competence is being evaluated.
Administer a practice assessment or pretest that gives students an idea of what the final assessment instrument will be like.	Don't keep the nature of the assessment a secret until the day it is administered.
Encourage students to do their best but not necessarily to expect perfection; for instance, say, "We're here to learn, and you can't do that without making mistakes."	Don't remind students that failing might have dire consequences.
Provide or allow the use of memory aids (e.g., a list of formulas or a single note card containing key facts) when instructional goals don't require students to commit information to memory.	Don't insist that students commit trivial facts to memory.
Eliminate time limits unless speed is an important part of the skill being measured.	Don't give more questions or tasks than students can possibly respond to in the time allotted.
Continually survey the room, and be available to answer students' questions.	Don't hover over students, watching them closely as they complete the assessment.
Use unannounced assessments (i.e., pop quizzes) only for formative assessments (e.g., to determine an appropriate starting point for instruction).	Don't give occasional pop quizzes to motivate students to study regularly and to punish those who study very little, if at all.
Use the results of several assessments to make decisions (e.g., to assign grades).	Don't evaluate students on the basis of a single assessment.

SOURCES: Agarwal et al., 2014; Brophy, 1986, 2004 ("We're here to learn . . ." suggestion on p. 274); Cassady, 2010; Cizek, 2003; Gaudry & Bradshaw, 1971; Hill, 1984; Hill & Wigfield, 1984; Spaulding, 1992; Stipek, 1993.

understanding of subject matter when they're asked to correct errors they've previously made on an assessment task. For example, in an approach known as *mastery reform,* some math teachers have students correct their errors as follows:

1. *Identification of the error.* Students describe in a short paragraph exactly what they don't yet know how to do.
2. *Statement of the process.* Using words rather than mathematical symbols, students explain the steps involved in the procedure they're trying to master.
3. *Practice.* Students demonstrate their mastery of the procedure with three new problems similar to the problem(s) they previously solved incorrectly.
4. *Statement of mastery.* Students state in a sentence or two that they've now mastered the procedure.

By completing these steps, students can replace a grade on a previous assessment with the new, higher one. A high school math teacher once told one of us authors that this approach also had a more general, long-term benefit for his students: Many of them eventually incorporated the four steps into their regular, internalized learning strategies.

- *When appropriate, allow students to retake assessments.* Some students will invariably need more time than others to master a topic and may therefore need to be assessed on the same material more than once. In addition, students are less likely to have debilitating test anxiety if they know they can have another try if they need one. Retakes are obviously quite appropriate for most formative assessments, but they have certain disadvantages for summative assessments. When students know they can retake a summative assessment if they get a low score the first time, they may prepare less well than they would otherwise. Furthermore, if they're allowed to retake the *same* assessment a second time, they may work on the specific things the assessment covers without studying equally important but non-assessed material. (Remember, most assessment tasks can cover only a small sample of the content in question.)

  If we truly want students to master course material but also to take risks in their learning and classroom performance, we may want to make retakes a regular practice. To encourage students to take the first assessment seriously and to discourage them from focusing only on the content of specific test items as they study for the retake, we might construct two assessment instruments for the same content domain, using one as the initial assessment and the other for retakes. If this strategy is too time consuming to be practical, we might allow students to redo the same assessment a second time and average the two scores earned.

Evaluating an Assessment after the Fact: Item Analysis Not only must we assess students' learning and achievement, but also we must *assess our assessments*. In the process of scoring students' performance on an assessment, we may discover that some items or tasks simply don't provide the information we had hoped they would. For example, it may become obvious that one item isn't measuring the knowledge or skill we had in mind (a validity problem) and that another is hard to score consistently (a reliability problem that indirectly affects validity as well).

Conduct an item analysis as one source of evidence for the validity and reliability of an assessment instrument.

We can't always predict which items are going to be good ones and which are not. For this reason, assessment experts frequently recommend conducting an **item analysis** after an assessment has been administered and scored. Such an analysis typically involves an examination of both the difficulty level and the discriminative power of each item.

Item difficulty. The **item difficulty (p)** of an assessment item is simply the proportion of students who have responded correctly relative to the total number of students who took the assessment:

$$p = \frac{\text{Number of students getting the item correct}}{\text{Number of students taking the assessment}}$$

This formula yields a number between 0.0 and 1.0. A high p value indicates that the item was relatively easy for students; for example, a p of .85 means that 85% of the students answered it correctly. A low p value indicates that the item was difficult; for example, a p of .10 means that only 10% gave a correct response.

In criterion-referenced assessments, p values help us determine the degree to which students are accomplishing instructional goals and objectives. If most students have responded to an item correctly and we can rule out guessing and other factors that may have contributed to the high success rate, we can conclude that students have mastered the knowledge or skill the item represents. A low p value tells us that either students haven't learned what we're assessing or the item doesn't accurately reflect what students *have* learned.

For norm-referenced assessments, p values are useful in a very different way: They help us determine which items have a difficulty level that is best for comparing the performance of individual students. In this situation, ideal p values are somewhere between .30 and .70, indicating that the items are difficult enough that some but not all students get them wrong. When, instead, almost all students answer an item in the same way—either correctly (a very high p) or incorrectly (a very low p)—we get little or no information about how students differ from one another.

Item discrimination. Imagine that you're scoring a 30-item multiple-choice test you've just given your class. You notice that the best students—those who have done well on most of the test—have answered Question 13 incorrectly. You also notice that several students who got very low test scores got Question 13 correct. This doesn't make sense: You'd expect the students who do well on any one item to be the same ones who perform well on the test overall. When the "wrong" students are getting an item correct—that is, when the item inaccurately identifies informed versus uninformed students—we have a problem with **item discrimination (*D*)**.

To determine item discrimination, we use the approach just described—that is, we identify two groups of students: those who have gotten the highest overall scores and those who have gotten the lowest overall scores, putting about 20% to 30% of the total number of students in each group. We then compare the proportions of students in the two groups getting each item correct using this formula:

$$D = \frac{\begin{array}{c}\text{Number of high-}\\\text{scoring students}\\\text{getting item correct}\end{array}}{\begin{array}{c}\text{Total number of}\\\text{high-scoring students}\end{array}} - \frac{\begin{array}{c}\text{Number of low-}\\\text{scoring students}\\\text{getting item correct}\end{array}}{\begin{array}{c}\text{Total number of}\\\text{low-scoring students}\end{array}}$$

The D formula yields a number ranging from -1.0 to $+1.0$. Positive D values tell us that more high-scoring students than low-scoring students have done well on an item; in other words, the item discriminates between knowledgeable and less knowledgeable students, which is exactly what we want. In contrast, negative D values reflect circumstances similar to the situation with our hypothetical Question 13: Low-scoring students answered the item correctly, but high-scoring students didn't. A negative D is often a sign that something's wrong with the item; perhaps it misleads knowledgeable students to choose what was intended to be an incorrect response, or perhaps we've marked an incorrect answer on our scoring guide.

Let's return to an assumption we made in the Question 13 situation: The students who do well on any single item should be the same ones who perform well overall. Here we're talking about *internal consistency reliability,* the extent to which different parts of an assessment instrument all measure more or less the same thing. However, when the items or tasks on an assessment instrument are all designed to measure very *different* things—as is often true for performance assessments—D values are less helpful in evaluating an item's effectiveness.

Many teachers save good assessment items for use on future occasions, perhaps putting them in appropriately labeled documents or folders on their computers. As teachers accumulate items over the years, they eventually have a large enough collection that they don't have to use any one item very often.

Save good test questions and assessment tasks for use in future years; take precautions to prevent students from getting unauthorized access to them.

Taking Student Diversity into Account in Classroom Assessments

Learning Objective 14.5 Describe individual and group differences that have implications for classroom assessment practices.

As we've seen, standardization of assessment instruments and procedures is important for fairness, reliability, and (indirectly) validity in our assessment results. Yet standardization has a downside: It limits our ability to accommodate students' diverse backgrounds and needs, capitalize on their individual strengths, and help them compensate for areas of weakness.

Standardization in classroom assessment practices is essential if, for some reason, we need to compare a student's performance to that of others. But in many other situations—for example, when we're trying to ascertain an appropriate starting point for instruction or specific weaknesses that each student needs to address—standardization is less critical. In some instances, in fact, we may find that the best way of assessing one student's learning is a relatively *ineffective* way of assessing another's.

Accommodating Group Differences

Let's remind ourselves of a few commonly observed differences, also remembering that these are only *average* differences and do not apply to all individuals:

You can find more information about these differences in Chapter 2 and Chapter 4.

- Boys tend to talk more in class than girls do.
- Girls tend to work harder on classroom assignments than boys do.
- Many students who have grown up in mainstream Western culture place high value on individual achievement, but those from some other cultures may be more accustomed to working as a group than to working alone.
- Many students brought up in mainstream Western culture are accustomed to showing others what they know and can do, but students from some cultural backgrounds may be more accustomed to practicing skills in private until they've achieved mastery.
- English language learners need considerable time—perhaps five to seven years—to master the levels of English vocabulary and syntax necessary to fully understand and learn from English-based instruction.
- Some students from low-income families lack adequate nutrition and health care to perform their best at school.
- Students at risk for academic failure may perceive academic subject matter to have little relevance to their own lives.

Use assessment tasks that are sufficiently diverse in nature to give all students numerous opportunities to show what they have learned.

Chapter 15 provides more information about assessment bias.

All of these factors may affect students' ability to learn and achieve in the classroom. But they may also affect how students perform on our informal and formal assessments *independently* of their learning and achievement. This is just one of the many reasons that we should consider multiple assessments—as well as several different kinds of assessments—to assign grades and make other important decisions. In addition, we should scrutinize our assessment tasks to be sure that they don't unfairly put some students at a disadvantage because of diversity in their life experiences—a disadvantage known as *cultural bias* or, more generally, *assessment* *bias*. Ultimately, our assessment practices must be fair and equitable for students of all groups and backgrounds.

Accommodating Students with Special Needs

In the United States, the Individuals with Disabilities Education Act (IDEA) mandates that schools make appropriate accommodations for students with physical, mental, social, or emotional disabilities. This mandate applies not only to instruction but to assessment practices as well. Consequently, we may sometimes have to disregard our concern about standardization so that we can gain more *valid* assessments of what students with certain disabilities know and can do. For example, we may have to develop student-specific summative assessments for students whose individualized education programs (IEPs) identify instructional goals different from those of their peers. In addition, sometimes we may have to provide some students with additional time to complete an assessment. Suggestions for additional accommodations for students with special needs are presented in Table 14.7.

Chapter 5 provides details about IDEA; it also identifies specific categories of special needs that fall within the five general categories listed in Table 14.7.

STUDENTS IN INCLUSIVE SETTINGS

Table 14.7 Using Classroom Assessments with Students Who Have Special Educational Needs

Category	Characteristics You Might Observe	Suggested Strategies
Students with specific cognitive or academic difficulties	• Poor listening, reading, and/or writing skills • Inconsistent performance due to off-task behaviors (for some students with learning disabilities or attention-deficit hyperactivity disorder) • Difficulty processing specific kinds of information • Higher-than-average test anxiety	• Make formal classroom assessments easy to read and respond to; for instance, space test items far apart, and have students respond to multiple-choice items directly on their test papers rather than on separate answer sheets. • If appropriate for the disability, provide extra time for students to complete assessment tasks and/or minimize reliance on literacy skills (e.g., read aloud test items and have students respond orally). • When students have a limited attention span, break lengthy assignments into several shorter tasks. • Provide extra scaffolding to guide students' efforts; give explicit directions about what students are expected to do. • Be sure students are motivated to do their best but not overly anxious. • Score responses separately for content and quality of writing. • Look at students' errors for clues about specific cognitive processing difficulties. • Use informal assessments to confirm or disconfirm the results of formal assessments.
Students with social or behavioral problems	• Inconsistent performance on classroom assessments due to off-task behaviors or lack of motivation (for some students)	• Make modifications in assessment procedures as necessary (see the strategies just presented for students with specific cognitive or academic difficulties). • Use informal assessments (e.g., observations of behavior) to confirm or disconfirm the results of formal assessments.
Students with general delays in cognitive and social functioning	• Slow learning and cognitive processing • Limited, if any, reading skills • Poor listening skills	• Be very explicit and concrete about what you're asking students to do. • Tailor any written assessment items to students' reading levels. • Use performance assessments that require little reading or writing. • Allow considerable time for students to complete assigned tasks.
Students with physical or sensory challenges	• Mobility problems (for some students with physical challenges) • Tendency to tire easily (for some students with physical challenges) • Less developed language abilities (for some students with hearing loss)	• Use written rather than oral assessments (for students with hearing loss). • Minimize reliance on visual materials (for students with visual impairments). • Use appropriate technology to facilitate students' performance. • Provide extra time for students to complete assessments. • Limit assessments to short time periods, and give frequent breaks. • Use simple language if students have language difficulties.
Students with advanced cognitive development	• Greater ability to perform exceptionally complex tasks • Unusual, sometimes creative responses to assessment tasks • Tendency to hide giftedness to avoid possible ridicule by peers (in some students)	• Use performance assessments to assess complex activities. • Establish scoring criteria that allow for unusual and creative responses. • Provide opportunities for students to demonstrate their achievements privately, especially if they're concerned that peers might disapprove of their exceptional ability level.

SOURCES: Barkley, 2006; Beirne-Smith et al., 2006; Ford & Harris, 1992; Gregg, 2009; Johnson et al., 2009; Lovett, 2010; Mercer & Pullen, 2005; Morgan & Jenson, 1988; Piirto, 1999; Sireci et al., 2005; Stein & Krishnan, 2007; Turnbull et al., 2010; Whitaker Sena et al., 2007.

Chapter 14 What Have You Learned?

Ongoing assessment of students' progress is—and *must* be—a critical part of our role as teachers. We now return to the chapter's learning objectives as a way of revisiting key ideas about classroom assessment.

14.1 Describe the various forms that classroom assessment can take and the various purposes it can serve for teachers and students. In general, *assessment* is a process of observing a sample of students' behavior and drawing inferences about their knowledge and abilities. It can take any number of forms: It might be formative or summative, informal or formal, writing or performance based, traditional or authentic, criterion-referenced or norm-referenced. Occasionally it takes the form of a standardized test, but far more often it consists of a teacher-developed instrument or procedure.

Classroom assessments serve a variety of interrelated purposes—to guide instructional decision making, determine students' achievement levels at the end of instruction, evaluate the quality of instruction, diagnose learning and performance problems, or promote students' short- and long-term learning and development. Regardless of our primary purposes in assessing students' knowledge and skills, we must remember that the nature of our assessment instruments will give students messages about what their learning priorities should be and how they should think about and study classroom subject matter. If we always talk about assessments and how important they are, then students may come to believe that the primary reason they go to school is to be tested (as opposed to going to school to actually learn). Not only is assessment closely interconnected with instruction but in a very real sense it *is* instruction.

14.2 Explain how you might enhance students' learning through frequent formative assessments and feedback. Formative assessments are those that occur before or during instruction in order to (a) guide instructional decision making and (b) facilitate students' progress toward instructional goals. To be useful, formative assessments must closely reflect the subject matter to be mastered (i.e., they should have content validity) and yield information about what students currently can and can't do. One key strategy is to construct a rubric that identifies the characteristics and components of desired performance; such a rubric provides clear goals toward which to aim. To most effectively promote students' learning and achievement over the long run, we should regularly include students in the assessment process—for example, by soliciting their ideas about evaluation criteria and by having them constructively critique their own and others' work. We should also consider how various digital technologies might facilitate our own and students' efforts to assess students' progress through the curriculum.

14.3 Define and apply four important RSVP characteristics of good assessments: reliability, standardization, validity, and practicality. As we identify our classroom assessment tasks and procedures, we should keep four characteristics in mind, especially when conducting summative assessments. First, a good assessment is *reliable*, yielding consistent results regardless of the circumstances in which we administer and score it. Second, it is *standardized*, in the sense that it has similar content and is administered and scored in a similar manner for everyone (except students who have certain extenuating circumstances). Third, it is *valid*, in that it's an accurate reflection of the knowledge or skills we're trying to assess. And fourth, it is *practical*, staying within reasonable costs and time constraints. No matter how well planned and executed it is, however, any single assessment almost invariably has limitations with respect to one or more of these characteristics. Accordingly, we must think of our classroom assessments as useful tools—but *imperfect* ones at best—that can guide us in our decision making.

14.4 Explain how you might conduct informal assessments, formal assessments, and performance assessments to evaluate students' learning and performance with reasonable reliability and validity. We can sometimes assess achievement informally, perhaps by simply observing what students do and say. Informal assessment is flexible and requires little or no advance planning, but unfortunately, it doesn't give us a representative sample of what students have learned, and our judgments will inevitably be biased by our existing beliefs about various students.

Whenever we must draw firm conclusions about what students have and haven't achieved—for example, when we assign final grades—we should base our conclusions largely on formal assessments that are reasonably valid and reliable. Especially important in this context is *content validity*: Our assessment tasks should provide a representative sample of what students have accomplished relative to instructional goals and objectives.

Formal assessment tasks take various forms; for instance, they might be multiple-choice questions, word problems, or essays. Different formats are suitable for assessing different instructional goals, and each format has advantages and disadvantages. Performance assessment tasks are often more appropriate for assessing complex achievements that require the integration of many skills, and accomplishment of some instructional goals can be assessed *only* through direct observation of what students can physically do. Formal assessments and performance tasks alike yield more valid and reliable results when students have a clear understanding of what they're supposed to do and when their responses are evaluated as objectively as possible.

Several additional strategies can, in one way or another, impact the quality of classroom assessments. First, we must be sure that students have some test-taking know-how, or testwiseness; for instance, they should have some sense of how to manage their time in any formal assessment task. Second, we should keep students' anxiety at productive, facilitative levels—for example, by emphasizing that learning is an ongoing process and inevitably involves making mistakes along the way. Third, our assessment practices must allow leeway for students to take the risks so essential for the pursuit of challenging topics and activities. Finally, after we've developed and used a particular assessment, an item analysis can help us determine whether the assessment results are reasonably representative of what students have learned.

14.5 Describe individual and group differences that have implications for classroom assessment practices. Although standardization of assessment instruments and procedures is important for fairness and reliability, it has a downside: It limits our ability to accommodate students' diverse characteristics, backgrounds, and abilities. Standardization is essential when we need to compare students' performances to one another in a norm-referenced manner. It's less important when we're trying to ascertain appropriate starting points for instruction or specific student weaknesses that need to be addressed, and it can sometimes be counterproductive when we're working with students who have disabilities.

Of the four RSVP characteristics, validity is the most critical one, and we can typically get a better handle on what students know and can do when we flexibly and open-mindedly assess their knowledge and skills in multiple ways.

Practice for Your Licensure Exam

Two Science Quizzes

Knowing that frequent quizzes will encourage students to study and review class material regularly, Mr. Bloskas tells his middle school science students that they'll have a quiz every Friday. As a first-year teacher, he has had little experience developing test questions; thus, he decides to use the questions in the test manual that accompanies the class textbook. The night before the first quiz, Mr. Bloskas selects 30 multiple-choice and true–false items from the manual, making sure that they cover the specific topics he has addressed in class.

Mr. Bloskas's students complain that the questions are "picky." As he looks carefully at his quiz, he realizes that they are right: The quiz measures nothing more than memorization of trivial details. So when he prepares the second quiz, he casts the test-item manual aside and writes two essay questions that ask students to apply principles they've studied to new, real-life situations.

The following Friday, students complain even more loudly about the second quiz: "This is too hard!" "We never studied this stuff!" "I liked the first quiz better!" Later, as Mr. Bloskas scores the essays, he's appalled to discover how poorly his students have performed.

1. ***Constructed-response question:***

   When identifying classroom assessment tasks, teachers must be sure that the tasks have validity, especially *content validity*.

   A. Compare Mr. Bloskas's two quizzes with respect to their content validity.

   B. Describe a reasonable approach Mr. Bloskas might use to create quizzes that have good content validity for his classes.

2. ***Multiple-choice question:***

   The following alternatives present four possible explanations for the students' negative reactions to the second quiz. Drawing on contemporary theories of learning and motivation, choose the most likely explanation.

a. Multiple-choice and true–false items are more likely than essay questions to enhance students' sense of autonomy.

b. Learners are most likely to behave and study in ways that they expect will lead to reinforcement.

c. Multiple-choice and true–false items are apt to foster mastery goals, whereas essay questions are more likely to foster performance goals.

d. Multiple-choice and true–false items almost always assess information in working memory, whereas essay questions usually assess information in long-term memory.

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Chapter 15

Summarizing Students' Achievements and Abilities

Ariel Skelley/Alamy Stock Photo

Learning Objectives

15.1 Describe the nature, advantages, and disadvantages of three types of test scores: raw scores, criterion-referenced scores, and norm-referenced scores.

15.2 Identify important guidelines to follow in summarizing students' achievement with final grades and portfolios.

15.3 Describe four general kinds of standardized tests, and explain how you might appropriately use and interpret these various tests.

15.4 Explain how high-stakes testing and teacher accountability practices can affect instruction and classroom learning, and suggest several strategies for enhancing the benefits of these practices.

15.5 Explain how you might accommodate group differences and special educational needs in your efforts to summarize students' achievement.

15.6 Distinguish between circumstances in which you should and should not reveal students' assessment results, and explain how you can effectively communicate these results to students and parents.

CASE STUDY

B in History

Amelia is the top student in Ms. Davidson's sixth-grade class. She is bright, motivated, and conscientious about completing her classwork, and she has consistently earned straight As on report cards in previous years.

At the end of the day one Friday, Ms. Davidson tells her class, "As you all know, our first-quarter grading period ended last week. Today I have your report cards for you to take home to your parents. I'm especially proud of one student who always puts forth her best effort, and her grades are almost perfect." She smiles at Amelia with obvious affection and hands her a report card. "Here you are. Just one B, Amelia, in history. I'm sure you'll be able to bring it up to an A next quarter."

Despite the praise, Amelia is devastated. The B has blindsided her; she had no idea it was coming. Embarrassed beyond words, she successfully fights back tears but looks down at her desk while Ms. Davidson distributes the other report cards. When the final school bell rings, Amelia quickly gathers her backpack and heads out the door, forgoing the usual after-school good-byes to her friends.

- Amelia's parents are unlikely to be concerned about her single B; they're more worried about Amelia's younger brother, a second grader who still can't read and probably has an undiagnosed learning disability. Why, then, might Amelia be so upset? Can you think of at least two possible explanations?
- Was it appropriate for Ms. Davidson to announce Amelia's grades to the class? Why or why not?

Although Amelia undoubtedly knows that she has made occasional errors on history assessments, she apparently hasn't been aware of how those errors might add up to a B rather than an A. And with her past straight-A record, she has set an extremely high standard for herself. Only perfection is good enough—an unrealistic standard held by many students (Parker, 1997). In addition, Ms. Davidson has announced Amelia's imperfection to the entire class. As a young adolescent, Amelia isn't sure which is worse: that her peers know she has earned the highest grades in the class or that they know she's *not* perfect in history. Not only does Ms. Davidson's announcement make Amelia extremely uncomfortable, but it also violates Amelia's right to confidentiality. In fact, as we'll discover later in the chapter, making a student's grades public, as Ms. Davidson does, is illegal, at least in the United States.

As teachers, we must eventually determine what students have accomplished during an academic term or school year. As we do so, we must keep the four RSVP characteristics of good assessment in mind. In particular, any overall indicator of achievement should be *reliable*, reflecting a consistent pattern of achievement rather than a rare, chance occurrence. It should also be *standardized*: Except for extenuating circumstances (e.g., for some students with disabilities), the same assessment criteria should apply to everyone. In addition, any summary of achievement should be *valid*; that is, it should accurately reflect what students have learned and achieved. Finally, it must be *practical* in terms of the time and effort it requires.

In this chapter we will first consider how we might summarize students' performance on a single assessment instrument. After that, we'll consider ways to summarize students' achievement on a broader scale.

Summarizing the Results of a Single Assessment

Learning Objective 15.1 Describe the nature, advantages, and disadvantages of three types of test scores: raw scores, criterion-referenced scores, and norm-referenced scores.

At times we might find it appropriate to describe in detailed written form how a student has performed on a particular assessment. But such an approach for every student and every assessment would be extremely time consuming. More often, then, we'll need to have some easy way of summarizing students' performance on individual assessments, perhaps using numbers or letter grades. To simplify our discussion, we'll focus largely on numbers, which we'll call *scores*. The scores on individual assessments, whether teacher-developed instruments or standardized tests, typically take one of three forms: raw scores, criterion-referenced scores, and norm-referenced scores.

Raw Scores

A **raw score** is based solely on the number of items answered correctly. For example, a student who correctly answers 15 items on a 20-item multiple-choice test might get a raw score of 15 out of 20. Raw scores often are represented using percentages; thus, a student who correctly answered 15 out of 20 questions would receive a score of 75%. A student who gets 3 points, 5 points, and 8 points on two essay questions and one performance task, respectively, might get an overall score of 16. Raw scores are easy to calculate, and they appear to be easy to understand. But in fact, we sometimes have trouble knowing what raw scores really mean. Are scores of 75% and 16 good scores or bad ones? Without knowing what kinds of tasks an assessment includes, we have no easy way of interpreting a raw score.

Use raw scores only when their meanings are easily understood.

Criterion-Referenced Scores

As you might guess, criterion-referenced scores and norm-referenced scores are used, respectively, with criterion-referenced and norm-referenced assessments. More specifically, a **criterion-referenced score** indicates what students have achieved relative to specific instructional objectives or content-area standards. Some criterion-referenced scores are either–or scores indicating that a student has mastered or not mastered a skill, met or not met an objective, or passed or failed a unit. Figure 15.1 illustrates this approach in a beginning swimming class. If we wanted to assign numbers to a student's performance, we could give a "1" for every skill the student has mastered and a "0" for any not mastered.

Figure 15.1 Example of a criterion-referenced checklist for a beginning swimming class.

Beginner Swimmer Class
Springside Parks and Recreation Department

Students must demonstrate proficiency in each of the following:

- ☐ Jump into chest-deep water
- ☐ Hold breath under water for 8 seconds
- ☐ Float in prone position for 10 seconds
- ☐ Glide in prone position with flutter kick
- ☐ Float on back for 10 seconds
- ☐ Glide on back with flutter kick
- ☐ Demonstrate crawl stroke and rhythmic breathing while standing in chest-deep water
- ☐ Show knowledge of basic water safety rules

Other criterion-referenced scores indicate various levels of competence or achievement, in which case we might use a rating scale or rubric. As an example, Figure 15.2 presents excerpts from a rubric designed to assess six qualities of good nonfiction writing: correct spelling, correct punctuation and capitalization, complete sentences, clear focus, logical train of thought, and convincing statements/arguments. To keep things simple, the figure shows only two rows of the rubric—those for (a) punctuation and capitalization and (b) clear focus. If we

Figure 15.2 Two of the six evaluation criteria in a rubric for evaluating students' nonfiction writing.

Characteristic	Proficient	In Progress	Beginning to Develop
Correct punctuation & capitalization	Writer uses punctuation marks and uppercase letters where, and only where, appropriate.	Writer occasionally (a) omits punctuation marks, (b) inappropriately uses punctuation marks, or (c) inappropriately uses uppercase/lowercase letters.	Writer makes many punctuation and/or capitalization errors.
Clear focus	Writer clearly states main idea; sentences are all related to this idea and present a coherent message.	Writer only implies main idea; most sentences are related to this idea; a few sentences are unnecessary digressions.	Writer rambles, without a clear main idea; or writer frequently and unpredictably goes off topic.

Based on "Enhancing Learning Through Formative Assessments and Effective Feedback" (interactive learning module), by J. E. Ormrod, 2015, in *Essentials of Educational Psychology* (4th ed.). Copyright 2015, Pearson.

wanted to assign numerical scores to a student's writing sample, we might use "3" to indicate a *proficient* rating, "2" to indicate *in progress*, and "1" to indicate *beginning to develop*. Such an approach is quite common as a strategy for assigning numerical scores to complex, multifaceted student products; however, its use is problematic, as we'll see in a moment.

Sometimes—and we need to stress the word *sometimes*—we can add up students' scores on individual criteria to obtain single, overall criterion-referenced scores. For example, we could do this with the swimming checklist shown in Figure 15.1. Students who get an overall score of 8—reflecting proficiency in all eight skills—are ready to move on to a more advanced class. But what if we want to add up a student's scores on all the criteria in a rubric for nonfiction writing? In this situation, we have two problems, both related to the *validity* of the overall scores we obtain. First, recall how we've just assigned scores of "3," "2," and "1" to the three levels of performance identified in the rubric. We can't really say that *proficient* is worth three times as much as *beginning to develop* and that *in progress* is midway in quality between the two other levels; the numbers we've used are strictly arbitrary. Second, adding up all the scores to get a single score is based on the assumption that all criteria in the rubric are equally important—for instance, that using correct punctuation and capitalization is just as important as having a clear focus—when this assumption isn't necessarily correct. We authors have no immediate remedy for these two problems; we simply point out that it doesn't always make sense to use rubrics to obtain single criterion-referenced scores (also see Humphry & Heldsinger, 2014; Reddy & Andrade, 2010). Moreover, many standardized tests that are used to assess student learning provide scores that are summarized by categorizing the student into one of several classifications. For example, some standardized test scores categorize students' knowledge as *below proficient*, *proficient*, or *advanced* (National Center for Education Statistics, 2021). Although some standardized assessments provide extensive data on the validity of such categorizations, quite often, limited evidence of validity is provided regarding how these distinctions are made (Haertel, 2018). Thus, it is possible that there could be a very small difference in the scores of a student who is classified as "below proficient" versus another who is classified as "proficient" in a particular academic domain. Given the variability and error often associated with any single assessment, as educators we should be cautious when using such assessment results to make decisions about students' learning and eligibility for various programs.

Norm-Referenced Scores

See Chapter 14 for a review of norm-referenced assessments.

A **norm-referenced score** is derived by comparing a student's performance on an assessment with the performance of others—perhaps that of classmates or perhaps that of students in a nationwide **norm group**. The scores for the comparison group comprise the **norms** for the assessment. A norm-referenced score might not tell us very much about what a student specifically knows and can do; instead, it tells us whether a student's performance is typical or unusual for their age or grade level.

Many published standardized tests yield norm-referenced scores. In some cases the scores are derived by comparing a student's performance with that of students at a variety of grade or age levels; such comparisons give us grade- or age-equivalent scores. In other cases the scores are based on comparisons only with students of the *same* age or grade; these comparisons give us either percentile scores or standard scores. As teachers, we need to be aware that when we report norm-referenced scores to students or parents, we may encourage the students to adopt performance goals, which, as we discussed in Chapter 11, may negatively affect motivation and performance, particularly when students receive information suggesting that they are not as capable as many of their peers (Meece et al., 2006).

Grade-Equivalent and Age-Equivalent Scores Imagine that Shawn takes a standardized test, the Reading Achievement Test (RAT). He gets 46 of the 60 test items correct; thus, 46 is his raw score. We turn to the norms reported in the test manual and find the average raw scores for students at different grade and age levels, shown in Figure 15.3. Shawn's raw score of 46 is the same as the average score of 11th graders in the norm group, so he has a **grade-equivalent score** of 11. His score is also halfway between the average score of 16-year-old and 17-year-old students, so he has an **age-equivalent score** of about 16.5. Shawn is 13 years old and in the eighth grade, and so he has obviously done well on the RAT.

In general, grade- and age-equivalent scores are determined by matching a student's raw score to that of a particular grade or age level in the norm group. A student who performs as well as the average second grader on a reading test will get a grade-equivalent score of 2, regardless of the student's actual grade level. A student who earns the same raw score as the average 10-year-old on a physical fitness test will get an age-equivalent score of 10, regardless of whether the student is 5, 10, or 15 years old.

Grade- and age-equivalent scores seem quite simple and straightforward but they have a serious drawback: They give us no idea of the typical *range* of performance for students at a particular grade or age level. For example, a raw score of 34 on the RAT gives us a grade-equivalent score of 8, but obviously, not all eighth graders will get raw scores of exactly 34. It's possible (and in fact quite likely) that many eighth graders will get raw scores several points above or below 34—yielding grade-equivalent scores of 9 or 7, perhaps even 10 or higher, or 6 or lower. Yet grade-equivalent scores are often used inappropriately as a standard for performance: Parents, school personnel, government officials, and the public at large may believe that *all* students should perform at grade level on an achievement test. Given that students' abilities vary considerably in most classrooms—and that, mathematically, students can't all score at average or above-average levels—this goal is actually impossible to meet.

Figure 15.3 Hypothetical norm-group data for the Reading Achievement Test (RAT).

Norms for Grade Levels		Norms for Age Levels	
Grade	Average Raw Score	Age	Average Raw Score
5	19	10	18
6	25	11	24
7	30	12	28
8	34	13	33
9	39	14	37
10	43	15	41
11	46	16	44
12	50	17	48

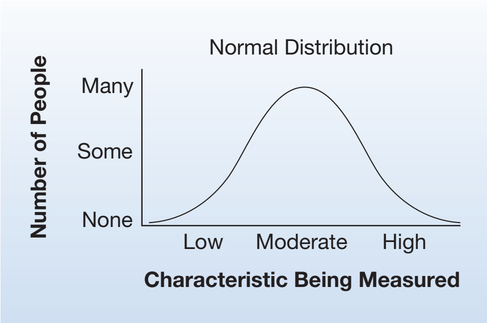
Percentile Scores A **percentile score**—sometimes instead called a *percentile rank* or, more simply, a **percentile**—is the percentage of people at the *same* age or grade level getting a raw score less than or equal to the student's raw score. To illustrate, let's once again consider Shawn's performance on the RAT. Because Shawn is in the eighth grade, we would turn to the eighth-grade norms in the RAT test manual. If we discover that a raw score of 46 is at the 98th percentile for eighth graders, we know that Shawn has done as well as or better than 98% of eighth graders in the norm group. Similarly, a student getting a percentile score of 25 has performed as well as or better than 25% of the norm group. It's important to note that a percentile score refers to a percentage of *people*, not to the percentage of correct items—a misconception that teacher education students sometimes have.

Percentile scores are relatively easy to understand and are therefore used frequently in reporting test results. Percentile scores on college admissions tests such as the SAT and the ACT sometimes are used by colleges in making decisions about admissions and scholarship allocations. But they have a major weakness: They distort actual differences among students. For example, consider the RAT percentile scores of these four boys:

Student	*Percentile Score*
Jared	45
Kyle	55
Giorgio	89
Mateo	99

In *actual achievement*—at least as measured by the RAT—Jared and Kyle are probably very similar to one another even though their percentile scores are 10 points apart. However, a 10-point difference at the upper end of the scale probably reflects a substantial difference in achievement: Giorgio's percentile score of 89 tells us that he knows quite a bit (relative to his peers), but Mateo's percentile score of 99 tells us that he knows an exceptional amount.

In general, percentiles tend to *over*estimate differences in the middle range of the characteristic being measured: Scores a few points apart reflect similar achievement or ability. Meanwhile, percentiles *under*estimate differences at the upper and lower extremes: Scores only a few points apart often reflect significant differences in achievement or ability. We can avoid these problems by using standard scores.

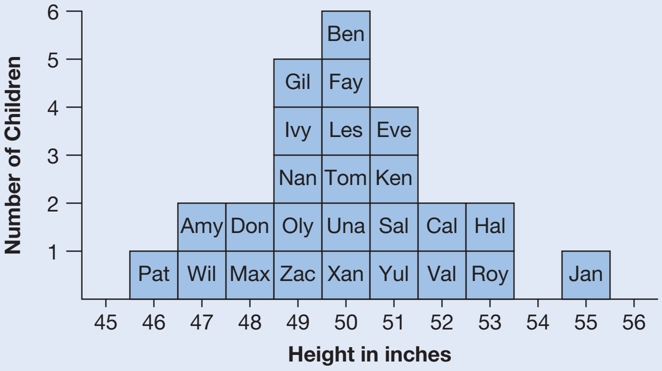


Standard Scores The school nurse measures the heights of the 25 students in Ms. Oppenheimer's third-grade class; these heights are listed on the left side of Figure 15.4. The nurse then creates a graph of the children's heights, shown on the right side of Figure 15.4. Notice that the graph is high in the middle and low at both ends. This shape tells us that most of Ms. Oppenheimer's students are fairly average in height, with only

Figure 15.4 Heights of children in Ms. Oppenheimer's third-grade class.

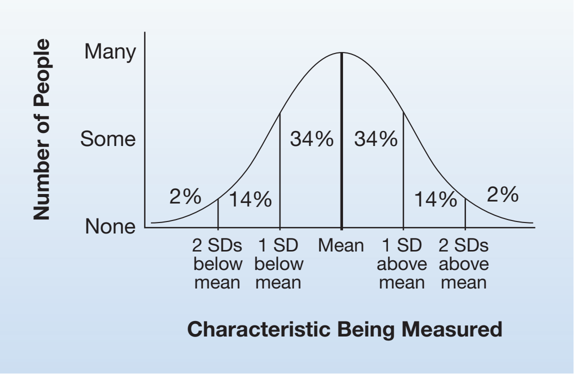
Heights (in inches)

Amy	47	Nan	49
Ben	50	Oly	49
Cal	52	Pat	46
Don	48	Roy	53
Eve	51	Sal	51
Fay	50	Tom	50
Gil	49	Una	50
Hal	53	Val	52
Ivy	49	Wil	47
Jan	55	Xan	50
Ken	51	Yul	51
Les	50	Zac	49
Max	48		



$$\textbf{Mean height} = \frac{\text{Sum of all children's heights}}{\text{Number of children}} = \frac{1{,}250}{25} = \mathbf{50}$$

Figure 15.5 A normal distribution divided by the mean and the standard deviation.



a handful of students being very short (e.g., Pat, Amy, Wil) and just a few others being very tall (e.g., Hal, Roy, Jan).

Many educational and psychological characteristics—including many academic abilities—seem to show roughly the same pattern we see for height: Most people are close to average, with fewer and fewer people being counted as we move farther from the average. This theoretical pattern of educational and psychological characteristics, known as the **normal distribution** (or **normal curve**), is shown in Figure 15.5. Standard scores are based on the normal distribution: Many students have scores in the middle range, and only a few have very high or very low scores.

Before we examine standard scores more closely, we need to understand two numbers used to derive these scores: the mean and the standard deviation. The **mean (M)** is the *average* of a set of scores: We add all the scores together—counting any given score as many times as the number of people who have earned it—and divide by the total number of scores (or people) in the set. For example, if we add the heights of all 25 students in Ms. Oppenheimer's class and divide the sum by 25, we get a mean height of 50 inches (see the calculation at the bottom of Figure 15.4).

The **standard deviation (SD)** indicates the *variability* of a set of scores (the extent to which scores *deviate* from the mean). A small number tells us that, generally speaking, the scores are close together, and a large number tells us that they're spread far apart. For example, third graders tend to be more similar in height than eighth graders; some eighth graders are less than 5 feet tall, whereas others may be almost 6 feet tall. The standard deviation for the heights of third graders is therefore smaller than the standard deviation for the heights of eighth graders. The formula for calculating a standard deviation is somewhat complex; we don't need to know the formula in order to understand the role that a standard deviation plays in standard scores. (In case you're curious, the standard deviation for the heights of Ms. Oppenheimer's students is approximately 2.06.). Although educators often find it useful to examine the mean score on a test, the standard deviation can be very useful as well. Try the following exercise for an example.

Experiencing Firsthand

Interpreting Test Results

Mrs. Lee, a ninth-grade language arts teacher, gives the same vocabulary test to the students in three different classes. The mean scores are 90 for first period, 91 for second period, and 89 for third period (out of 100). Based on the means, Mrs. Lee concludes that overall her classes are doing quite well and in general have learned the vocabulary words. *Do you agree with Mrs. Lee's conclusion?* (Answer this before reading the next paragraph.)

Mrs. Lee uses a spreadsheet to record her grades, and is also able to calculate the standard deviations for each class. She learns that the standard deviations are 4.29 for period 1, 11.17 for period 2, and 12.40 for period 3. Now that you have this additional information, has this altered your conclusion about how well each class did? (Answer this before reading the next paragraph.)

Mrs. Lee then decides to examine the distributions of scores in the three classes more closely. These are presented in Figure 15.6.

Although the means for the three classes are very close, the standard deviations tell a different, but very important story. The relatively low standard deviation for period 1 (4.29) indicates that there isn't much variation in the students' test scores—indeed, most students did score relatively close to the mean of 90. But the higher standard deviations in periods 2 and 3 show us that although the means are about the same (91 and 89), there is much more variability in the scores. In period 2, most of the students did very well on the test but two students did quite poorly (with scores of 65). And in period 3, although six students got a perfect score of 100 and another got an almost perfect score of 97, many of the other students did quite poorly on the exam. By only examining the means, Mrs. Lee probably would conclude that she could move on to new vocabulary since most of her students have learned the content; but in reality, there are students in periods 2 and 3 who clearly have not mastered the vocabulary, and probably need to work on these words more before moving on.

Figure 15.6 Vocabulary test scores for three different classes.

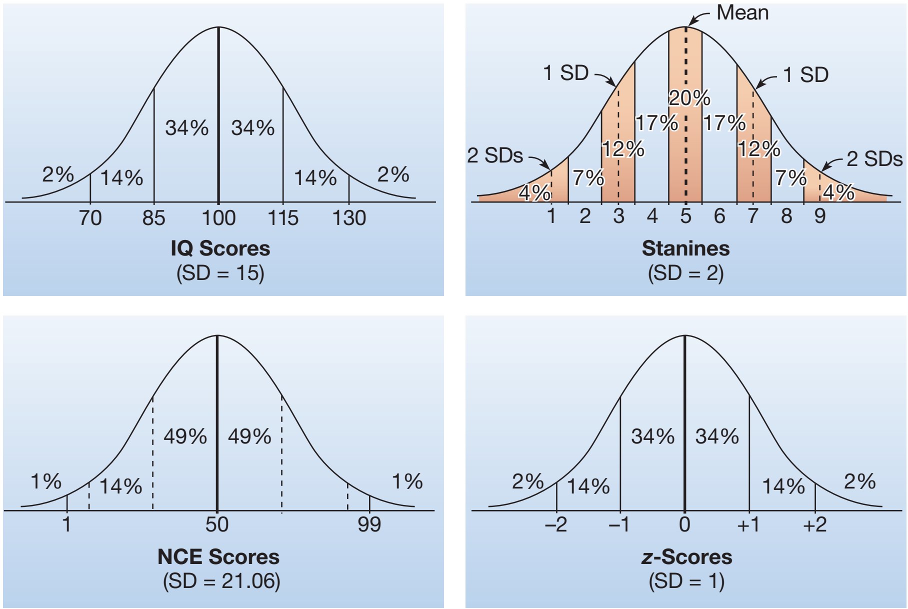
	Period 1	Period 2	Period 3
	99	100	100
	95	100	100
	92	98	100
	88	95	100
	84	98	100
	83	65	77
	90	65	82
	90	99	75
	94	95	77
	90	95	68
	90	88	100
	92	87	80
	88	92	97
		91	
		90	
Mean	90	91	89
Standard Deviation	4.29	11.17	12.40

The mean and standard deviation can be used to divide the normal distribution into several parts, as shown in Figure 15.5. The vertical line in the middle of the curve shows the mean; for a normal distribution, it's both the midpoint and the highest point of the curve. The thinner lines to either side reflect the standard deviation: We count out 1 standard deviation higher and lower than the mean and mark those two spots with vertical lines, and then we count another standard deviation to either side and draw two more lines. When we divide a true normal distribution in this way, the percentages of students getting scores in each part are always the same. Approximately two-thirds (68%) get scores within 1 standard deviation of the mean (34% in each direction). As we go farther away from the mean, we find fewer and fewer students, with 28% being between 1 and 2 standard deviations away (14% on each side) and only about 4% being more than 2 standard deviations away (2% at each end).

Now that we better understand the normal distribution and two statistics that describe it, let's return to standard scores. A **standard score** reflects a person's position in the normal distribution: It tells us how far the person's performance is from the mean in terms of standard deviation units. Unfortunately, not all standard scores use the same scale: Scores used for various tests have different means and standard deviations. Four commonly used standard scores, depicted graphically in Figure 15.7, are the following:

- **IQ scores** are frequently used to report students' performance on intelligence tests. They have a *mean of 100* and, for most tests, a *standard deviation of 15*.
- **Stanines** (short for *standard nines*) are often used in reporting standardized achievement test results. They have a *mean of 5* and a *standard deviation of 2*. Because they're

Figure 15.7 Distributions of four types of standard scores.



always reported as whole numbers, each score reflects a *range* of test performance, indicated by the shaded and nonshaded portions of the upper-right-hand curve in Figure 15.7.

- **NCE scores** (short for *normal-curve-equivalent scores*) are increasingly being used in reporting standardized achievement test results. They have a *mean of 50* and a *standard deviation of 21.06*. However, it isn't possible to get a score of zero or below, nor is it possible to get a score of 100 or above.
- ***z*-scores** are the standard scores that statisticians most often use. They have a *mean of 0* and a *standard deviation of 1*.

Figure 5.1 in Chapter 5 shows the distribution of IQ scores broken up by lines that each reflect one-third of a standard deviation (5 points). The lines for 85 and 115 are 1 standard deviation from the mean of 100. The lines for 70 and 130 are 2 SDs from the mean.

The odd standard deviation for NCE scores (21.06) requires an explanation. It turns out that with this particular standard deviation, an NCE score of 1 is equivalent to a percentile score of 1 and, likewise, an NCE score of 99 is equivalent to a percentile score of 99. And, of course, an NCE score of 50 (being the mean and midpoint of the curve) is also a percentile score of 50. Thus, NCE scores have the same overall range as percentile scores.

Typically the publishers of standardized achievement tests report students' test results using two or more types of scores (e.g., a total score and a percentile). For example, a student received a total SAT score of 1010. The score is at the 50th percentile for a nationally representative sample, but only at the 36th percentile for students who take the SAT. What does that mean? This means that 50% of typical students in the United States received lower total scores; but it also means that only 36% of students who typically take the SAT scored lower than did this student. Thus, the same total score (1010) takes on different meanings, depending on the comparison group (The College Board, 2017). Table 15.1 provides a summary of raw scores, criterion-referenced scores, and norm-referenced scores.

Using Criterion-Referenced versus Norm-Referenced Scores in the Classroom

In most instances criterion-referenced scores communicate what we and our students most need to know: whether instructional goals and content-area standards are being achieved. Criterion-referenced scores can also focus students' attention on mastery goals and, by showing improvement over time, can enhance their self-efficacy for learning.

COMPARE/CONTRAST

Table 15.1 Scores Used to Summarize the Results of a Single Assessment

Type of Score	Method of Determining Score	Uses	Potential Drawbacks
Raw score	Counting the number (or calculating a percentage) of correct responses or points earned	Often used in teacher-developed assessment instruments	Scores may be difficult to interpret without knowledge of how performance relates either to a specific criterion or to a norm group.
Criterion-referenced score	Comparing performance to one or more criteria or standards for success	Useful when determining whether specific instructional goals or standards have been achieved	Concrete criteria for assessing mastery of complex skills are sometimes difficult to identify. Also, combining separate scores for different criteria into a single overall score may seriously jeopardize validity.
Grade- or age-equivalent score (norm-referenced)	Equating a student's performance to the average performance of students at a particular grade or age level	Useful when explaining norm-referenced test performance to people who are unfamiliar with standard scores	Scores are frequently misinterpreted (especially by parents), may be inappropriately used as a standard that all students must meet, and are often inapplicable when achievement is being assessed in adolescence or adulthood.
Percentile rank (norm-referenced)	Determining the percentage of students at the same age or grade level who have obtained the same score or lower scores	Useful when explaining norm-referenced test performance to people who are unfamiliar with standard scores	Scores overestimate differences near the mean and underestimate differences at the extremes.
Standard score (norm-referenced)	Determining how far the performance is from the mean (for the grade or age level) in terms of standard deviation units	More accurate in characterizing students' ability differences than grade-equivalent scores, age-equivalent scores, or percentile ranks	Scores are not easily understood by people who don't have some basic knowledge of statistics.

When criterion-referenced scores are hard to determine—perhaps because an assessment simultaneously addresses many instructional goals and objectives (something we authors don't generally recommend)—raw scores are usually the second-best choice for teacher-developed assessments. But we must remember an important point about raw scores: They don't often tell us very much about what students have and haven't specifically learned.

Use criterion-referenced scores to indicate mastery of specific instructional goals and objectives.

Norm-referenced scores—in everyday lingo, *grading on the curve*—may occasionally be appropriate if we truly need to know how students have performed relative to one another. For example, we might find these scores helpful when designating first chairs in an instrumental music class (best violinist) or when choosing the best entries for a regional science fair.

Use norm-referenced scores only when you truly need to compare various students' performances.

We probably *shouldn't* use norm-referenced scores for teacher-developed assessments on a regular basis, however. Such scores create a competitive situation, because students do well only if their performance surpasses that of their classmates. Thus, norm-referenced scores focus students' attention primarily on performance goals rather than on mastery goals and may possibly encourage students to cheat on assessment tasks. Furthermore, the competitive atmosphere that norm-referenced scores create is likely to undermine students' general *sense of community* as a class (Anderman et al., 1998; Brophy, 2004; Wang & Holcombe, 2010).

Chapter 12 describes the many benefits of having a sense of community in the classroom.

Determining Achievement Using Final Grades and Portfolios

Learning Objective 15.2 Identify important guidelines to follow in summarizing students' achievement with final grades and portfolios.

Especially in the upper elementary and secondary school years, most schools use letter or number grades to summarize student achievement. Such grades have several limitations. First, different teachers are apt to use varying criteria to assign grades; for instance, some are more lenient than others, and some stress rote memorization whereas others stress complex cognitive skills. Quite often, teacher-assigned grades are not highly correlated with standardized test scores (Hübner et al., 2020). Second, different students may be working to accomplish different instructional goals, especially in classes that include children of diverse backgrounds and needs. Third, typical grading practices often promote performance goals rather than mastery goals and may encourage students to go for the "easy A" instead of taking on challenges. Finally, students under pressure to achieve high grades may resort to cheating (e.g., plagiarizing someone else's work) in order to attain those grades (Anderman & Koenka, 2017; Cizek, 2003; O'Connor, 2011; Pulfrey et al., 2011).

Despite their drawbacks, final class grades continue to be the most common method of summarizing students' classroom achievement. The following recommendations can enhance their validity and usefulness.

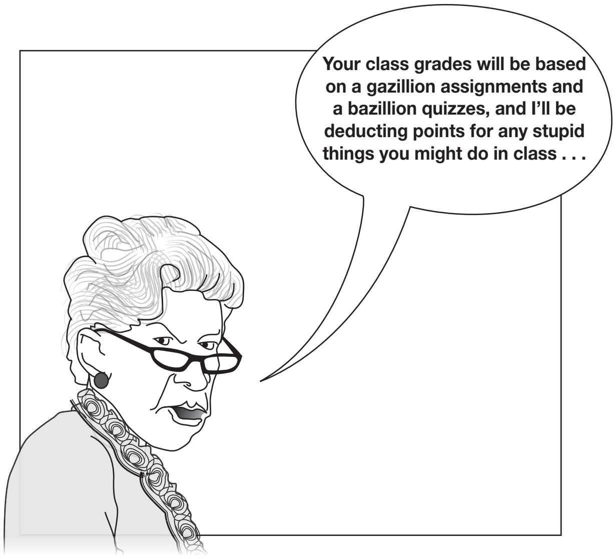
- *Take the job of grading seriously.* Consider these scenarios:
  - A high school math teacher makes numerous errors in calculating students' final grades. As a result, some of his students get lower grades than they've earned.
  - A middle school Spanish teacher asks her teenage son to calculate her students' final grades. Some columns in her online gradebook are only for scores on retests, so students who didn't need to retake tests have blanks in these columns. The son treats all blank spaces as zeros and thus gives grades of D or F to some of the highest achievers.

A math teacher who makes mathematical errors? A Spanish teacher who has her son determine final grades? Preposterous? Both scenarios are true stories. Students' final class grades are often the *only* data that appear in their school records, so we must take the time and make the effort to ensure that they're accurate. An incorrectly calculated grade will affect a student's overall grade point average, and that can affect competitiveness for admission to some colleges, eligibility for some scholarships, and entitlement to participate in some programs.

Many programs, learning management systems, and apps provide electronic gradebooks that can help us with record keeping and grading. In addition to helping us keep track of a sizable body of assessment information, electronic gradebooks make it easy to keep students and their parents continually informed about their performance and progress. We can't use these gradebooks mindlessly, however.

- *Base grades on achievement.* Tempting as it might be to reward well-behaved, cooperative students with good grades and to punish chronic misbehavers with Ds or Fs, grades should ultimately reflect how much students have *learned*. Awarding good grades simply for good behavior may mislead students and their parents to believe that students are making better progress than they really are. And awarding low grades as punishment for disruptive behavior leads students to conclude, perhaps with good reason, that their teacher's grading system is arbitrary and meaningless (Brookhart, 2004; Cizek, 2003; O'Connor, 2011; Shepard et al., 2005).
- *Base grades on hard data.* Our informal judgments of students' current achievement levels will be imperfect assessments at best, and they can easily be influenced by other things we know about students—for example, how often they misbehave in class and what their past achievement levels have been (Carbonneau & Selig, 2011; Robinson & Lubienski, 2011; Südkamp et al., 2012). For this reason and also for the sake of our students—who learn more and achieve at higher levels when we tell them what we expect in concrete terms—we should base grades on objective information derived from formal assessments, *not* on subjective impressions of what students appear to know.
- *Use many assessments to determine grades, but don't count everything.* Using multiple assessments to determine final grades can help us compensate for the imperfect reliability and validity of any single assessment. At the same time, we probably don't want to consider *everything* students do, in part because we want them to

feel comfortable taking risks and making mistakes, and learning from those mistakes without penalty. Thus, we may not want to include students' early efforts at new tasks, which are likely to involve considerable trial and error. Many assessments are more appropriately used for formative assessment purposes—to help students learn—than for summative assessment (Frisbie & Waltman, 1992; Nitko & Brookhart, 2011; Shepard et al., 2005).


Your class grades will be based on a gazillion assignments and a bazillion quizzes, and I'll be deducting points for any stupid things you might do in class . . .

Although overall class grades should be based on multiple sources of data, not everything needs to be graded. Furthermore, students must feel confident that they have some leeway to take risks and make errors.

- *Assign criterion-referenced grades unless there is a compelling reason to do otherwise.* Many experts recommend that final grades reflect mastery of academic content—in other words, that final grades be criterion-referenced. Criterion-referenced grades are especially appropriate during the elementary years: Much of the elementary school curriculum consists of basic skills that are either mastered or not mastered, and there's little need to use grades as a basis for comparing students with one another.

The issue becomes more complicated at the secondary level: Students' grades are sometimes used to choose college applicants, award scholarships, and make other comparative decisions. Historically, then, some secondary school teachers have used norm-referenced grades—for instance, giving As to the top 10% of each class, Bs to the next 20%, Cs to the middle 40%, and so on. We personally recommend that high school grades be criterion-referenced to the extent possible. The most critical decisions for which grades are used—decisions about promotion and graduation—should be based on students' mastery of the school curriculum, not on their standing relative to others. Furthermore, because different classes of students often differ in ability level, a strictly norm-referenced approach might assign a C grade to a student's performance in one class (e.g., Honors Math), whereas the same performance might warrant an A in another class (e.g., General Math). (Under such circumstances, a student striving for a high grade point average would be foolish to enroll in the honors section.) Finally, only a very few students (i.e., the highest achievers) find a norm-referenced grading system motivating; most students quickly resign themselves to achieving at an average level at best (Ames, 1984; Anderman, 2021; Anderman & Anderman, 2021; Graham & Golen, 1991; Shih & Alexander, 2000; Stipek, 1996).[1]

When setting up a criterion-referenced grading system, we should determine as concretely as possible what we want each grade to communicate. For example, if we're assigning traditional letter grades, we might use criteria such as the following:

Grade	*Criteria*
A	The student has a firm command of both basic and advanced knowledge and skills in the content domain. They are well prepared for future learning tasks.
B	The student has mastered all basic knowledge and skills. Mastery at a more advanced level is evident in some but not all areas. In most respects they are ready for future learning tasks.
C	The student has mastered basic knowledge and skills but has difficulty with more advanced aspects of the subject matter. They lack a few prerequisites critical for future learning tasks.
D	The student has mastered some but not all of the basics in the content domain. They lack many prerequisites for future learning tasks.
F	The student shows little or no mastery of instructional objectives and cannot demonstrate the most elementary knowledge and skills. They lack most of the prerequisites essential for success in future learning tasks. (Based on criteria described by Frisbie & Waltman, 1992)

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[1] Over the past several decades, teachers have gradually moved from norm-referenced grading (i.e., grading on the curve) to criterion-referenced grading. This focus on mastery of instructional goals and objectives, rather than on comparing students with one another, accounts in part for the increasing grade point averages (i.e., "grade inflation") about which some public figures complain. In fact, the gradual movement toward assigning students' grades based on absolute achievement levels rather than peer-group comparisons has probably yielded *increases* in the validity of students' final grades (Pattison et al., 2013).

Only when final grades reflect criteria such as these and are determined based on measurable student outcomes (and not just on our opinions) can they legitimately be used for instructional decision making.

- *Identify a reasonable grading system and stick to it.* Consider this situation:

  At the beginning of the school year, Ms. Giroux announces that final class grades will be based entirely on students' quiz scores. But after a few weeks she realizes that if she relies *only* on quiz scores, most students will get a D or F for the semester. To help students boost their grades, she asks them to turn in all previous homework assignments, which can contribute up to 20 percentage points toward final grades. The students protest loudly and angrily: Thinking there was no reason to keep completed assignments, many students have already discarded them.

  If most students are getting Ds and Fs, something's definitely wrong. Perhaps Ms. Giroux's instructional methods aren't as effective as other approaches might be. Perhaps she's moving so quickly through the curriculum that students never have time to master a topic.

  As teachers, we can't always anticipate how best to teach a new topic or how well students will perform on particular assessments. Nevertheless, if we want to give students a sense that they have some control over their grades—that is, if we want them to have internal, controllable attributions for their classroom performance—we must tell them early in the school year or semester what our grading criteria will be. In addition, by providing concrete information about how we'll be assigning grades, we avoid unpleasant surprises when students actually receive their grades (recall Amelia's sense of devastation in the opening case study). If we find that our initial criteria are overly stringent, we may need to lighten up, perhaps by adjusting cutoffs or allowing retakes of critical assessments. But we must never change our criteria in midstream in a way that unfairly penalizes some students or imposes additional, unanticipated requirements.

See Chapter 11 for a discussion of how students' attributions influence their motivation and learning.

- *Accompany grades with qualitative information about students' performance.* Whether final grades take the form of letters or numbers, they are, at best, only general indicators of some *quantity* of what students have learned. Thus, it's often helpful to accompany grades with *qualitative* information—for instance, detailed comments about students' particular academic strengths, work habits, attitudes, social skills, and unique contributions to the classroom community. For example, consider these comments that a teacher provided to a student about his writing: "I love your sense of humor. You make me laugh with your great riddles and jokes. The humor in your stories is very creative and keeps your audience wanting to know more about the story." Students and parents often find such comments like this just as informative as final class grades—sometimes even more informative. Moreover, comments like this communicate to students that you have really read and thought about their work and that you care about their learning—and by communicating that you care, you can enhance your students' engagement in your class (Quin, 2017). The feedback should be fairly explicit, however; comments such as "A pleasure to have in class" communicate little (Brookhart, 2004, p. 183).

Considering—Or Not Considering—Other Factors in Grading

As teachers, we need to consider what other factors, in addition to achievement, should be included in the final grades that we assign (Pope et al., 2009). Some educators suggest that students be graded at least partly on the basis of how much they improve, how hard they try, how much extra work they do, or whether they've turned assignments in late (if at all). Whereas this is a good recommendation in principle, care must be taken when including these factors in grading.

Considering Improvement Many motivation theorists stress the importance of focusing students' attention more on their own improvement than on how their performance compares with that of peers, because students are more likely to adopt mastery goals. While we encourage you to consider improvement, there are a few caveats to remember. First, students who already show accomplishment of some of the year's instructional goals may have less room for improvement than their classmates; this can be alleviated though by allowing students to strive to reach additional or higher-level goals. Second, when we use improvement as a criterion, some students trying to "beat the system" may quickly realize that they can achieve high grades simply by performing as poorly as possible when the school year begins (Airasian, 1994; Miller et al. 2009; Sax, 2010).

How do we balance what motivation researchers recommend with the cautions suggested by assessment experts? Here are several possible strategies:

- Assign greater weight to assessments conducted at the end of the semester or school year, after *all* students have had a reasonable opportunity to achieve instructional goals.
- Give students a chance to correct their errors and, in doing so, to demonstrate mastery.
- Administer retakes of assessments, perhaps using items or tasks different from those presented the first time.
- Reinforce improvement in other ways—for instance, with free time or special privileges. (Lester et al., 1997; O'Connor, 2011; Shepard et al., 2005)

Considering Effort Some assessment experts caution us *not* to base final grades on the amount of effort students appear to exert in their studies. For one thing, students who begin the year already performing at a high level may end up being penalized because they may not have to work as hard as their less knowledgeable classmates; nevertheless, we can avoid this if we set individualized goals for students. If the curriculum states that students must learn the days of the week and the months of the year in Spanish, and a student masters that quickly, there is no reason why we can't then have that student learn the seasons and other related vocabulary. Importantly, however, student effort is something we can evaluate only subjectively and imprecisely at best. When we do consider effort, we need to make sure that students know why their efforts have led to success—merely giving effort "points" without students understanding how their efforts to use specific strategies led to enhanced achievement is not advisable (Amemiya & Wang, 2018; Brookhart, 2004; O'Connor, 2011; Shepard et al., 2005).

An alternative is to have students work for individualized instructional goals appropriate for their existing ability levels. Such an approach is workable *if*, when we report students' final grades, we also report the instructional goals on which the grades are based. In fact, this approach is widely used for students with special educational needs, whose goals are described in their individualized education programs (IEPs).

Obviously, we enhance students' motivation when we explicitly acknowledge their effort. Some school systems have multidimensional grading systems that allow teachers to assign separate grades to the various aspects of students' classroom performance. Such mechanisms as brief written notes to parents, parent–teacher conferences, and letters of recommendation to colleges provide additional means by which we can describe the multifaceted nature of students' classroom performance.

Giving extra credit. As college professors, we've occasionally had students appear at our office doors asking—sometimes begging—for an opportunity to improve their grades at the last minute by completing extra-credit projects. Our response is invariably *no*, and for a very good reason: Our course grades are based on the extent to which students achieve instructional goals for the course, as determined by their performance on assessments that are the same or equivalent (and therefore standardized and fair) for

Be sure that any extra-credit assignments relate to instructional goals and are available to all students.

all students. Extra-credit projects assigned to only one or two students (typically those achieving at a low level) are insufficient to demonstrate mastery of the subject matter and aren't standardized for the entire class.

Extra-credit work is occasionally appropriate *provided that* (a) the work relates to instructional goals and (b) all students have the same opportunity to complete it (Padilla-Walker, 2006; Shepard et al., 2005). It *isn't* appropriate when its only purpose is to help a failing student earn a passing grade.

Addressing lateness and missing work. We want students to learn to be punctual in submitting assignments, in part because it will be hard for them to complete all of their work at the last minute—and they're apt to learn less when they finally do it—and in part because a habit of meeting deadlines will be important for their success in the adult workplace. Nevertheless, students may occasionally have justifiable reasons for a late submission—perhaps because of a lengthy illness, an unexpected crisis at home, or unanticipated confusion about what an assignment requires.

A few students may consistently *not* turn in assignments, especially ones they've been asked to do outside of class. Some of these students may believe these assignments are pointless and irrelevant to their lives and needs. Others may be reluctant to admit that they don't have the basic knowledge and skills they need to complete the assignments. Still others may have poor self-regulation skills; for example, they may be easily enticed into nonacademic activities once they leave the school building. And some of our students may not have the resources that they need to concentrate on and complete their homework—for example, some students have very chaotic home lives, and some may be responsible for caring for younger siblings after school and in the evenings.

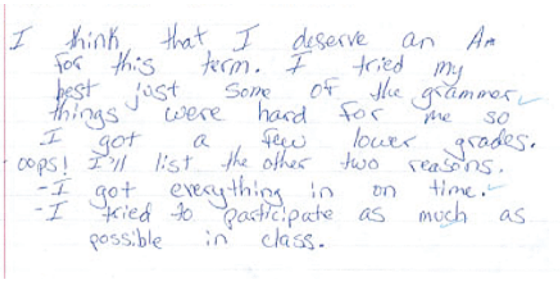
With such issues in mind, experts recommend that we *not* take off points for late submissions or grade missing assignments as *zeroes* that enter into our final grade calculations. Remember, final grades should reflect *actual achievement* related to instructional goals and objectives. Strategies such as the following can be more productive:

- Explain why punctuality is important for students' long-term success.
- Solicit students' input about reasonable deadlines for assignments.
- Give students the extra guidance and support they might need to complete assignments in a timely manner.
- If the school grading system allows it, record a student's grade as "Incomplete" and describe the work the student must do in order to get a passing grade.
- Base *all* students' final grades on only a subset of summative assessment results; this final strategy works only if the subset can validly and reliably reflect all instructional goals. (Brookhart, 2004; Nitko & Brookhart, 2011; O'Connor, 2011)

Including Students in the Grading Process

Let's return to the opening case study, in which Amelia is blindsided by her B in history. Although Amelia has been informed of her scores on various assessments during the grading period, she apparently hasn't been aware of how those scores would be combined into an overall grade. Ms. Davidson has presumably been tracking Amelia's progress over time, but Amelia herself hasn't been doing so.

Figure 15.8 In her rationale for getting an A for the term, 15-year-old Lexie focuses on effort, punctuality, and class participation rather than on achievement.



I think that I deserve an A
for this term. I tried my
best just some of the grammer
things were hard for me so
I got a few lower grades.
oops! I'll list the other two reasons.
-I got everything in on time.
-I tried to participate as much as
possible in class.

Ann Shump

In previous chapters, we've repeatedly seen benefits of self-assessment for self-regulation and motivation. In the end, however, we teachers must be the ones to determine students' final grades, as most students are likely to give themselves grades based on what they would *prefer* rather than what they've objectively *earned* (e.g., see Figure 15.8). Yet final grades shouldn't seemingly come out of the blue. Students must know, in advance and in concrete terms, our criteria for assigning grades, and we must frequently update students about their progress, perhaps by using one of the electronic gradebooks described earlier. Under these conditions, students *do* have a say in their grades—by working hard to master classroom subject matter.

Using Portfolios

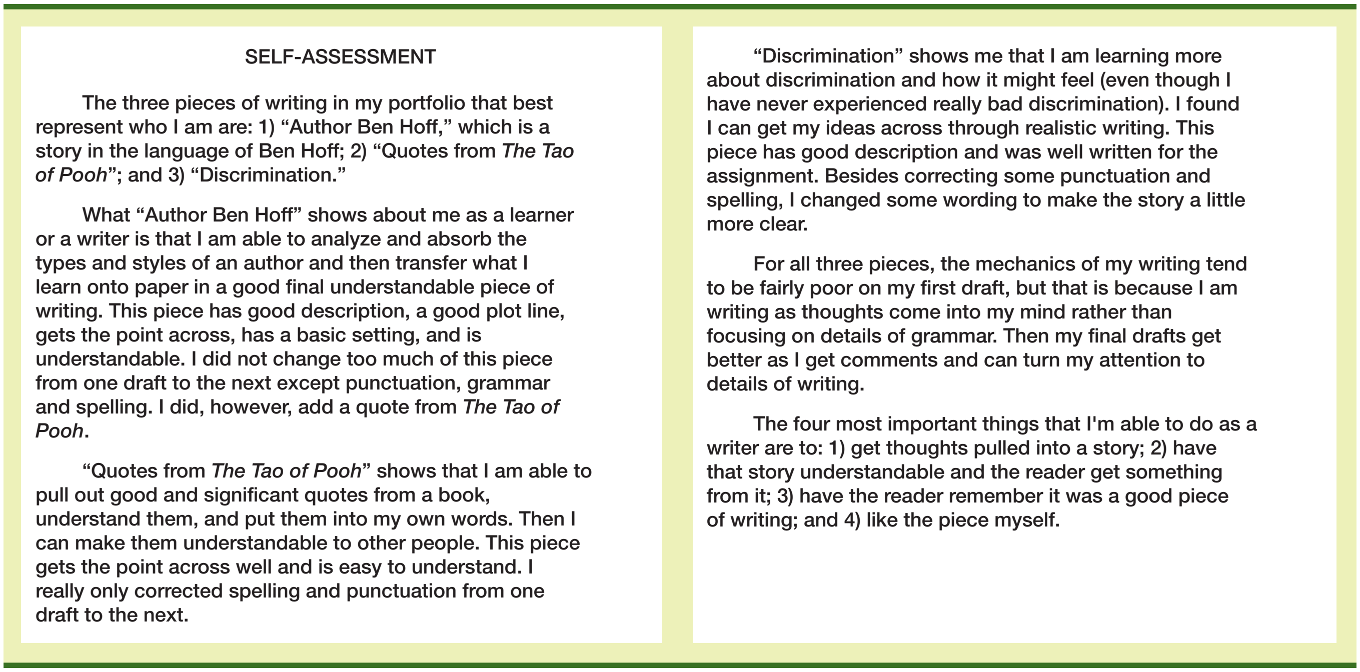
Whenever we boil down students' achievement into single letter or number grades, we lose valuable information about their specific strengths and weaknesses, inclinations and disinclinations, and so on. In contrast, **portfolios**—collections of work systematically collected over time—can capture the complex, multifaceted nature of students' accomplishments and interests. Portfolios might include writing samples, student-constructed objects (e.g., sculptures, inventions), photographs, audio or video recordings, technology-based creations (e.g., PowerPoint presentations, student-authored video games), or any combination of these.

Traditionally most portfolios have been actual physical entities that include various examples of students' work. But such a collection can sometimes be cumbersome and difficult to transport from one place to another. An alternative is an **electronic portfolio** (sometimes simply called an *e-folio* or a *digital portfolio*) in which portfolio contents—perhaps including writing samples, audiovisual materials, or photographs of creations—are stored and presented via portable electronic storage devices (e.g., flash drives) or on a server or an internet-based storage service (e.g., a "cloud") (Brookhart & Nitko, 2019; Zecker, 2015).

The items included in a portfolio are often called *artifacts*. Students typically decide for themselves which artifacts to include, perhaps with the guidance of a teacher. This decision-making process can give students a sense of ownership of their portfolios, enhance their sense of autonomy, and bolster their intrinsic motivation to gain new knowledge and skills.

In addition to specific artifacts, most portfolios include student reflections that (a) identify the purpose(s) and goals of the portfolio, (b) describe each artifact and the reason(s) it was included, and (c) summarize what the collection of artifacts reveals about the student's achievement. For example, in Figure 15.9, 14-year-old Kurt describes

Figure 15.9 In this self-reflection, 14-year-old Kurt explains why he has chosen certain pieces to include in his eighth-grade language arts portfolio.



SELF-ASSESSMENT

The three pieces of writing in my portfolio that best represent who I am are: 1) "Author Ben Hoff," which is a story in the language of Ben Hoff; 2) "Quotes from *The Tao of Pooh*"; and 3) "Discrimination."

What "Author Ben Hoff" shows about me as a learner or a writer is that I am able to analyze and absorb the types and styles of an author and then transfer what I learn onto paper in a good final understandable piece of writing. This piece has good description, a good plot line, gets the point across, has a basic setting, and is understandable. I did not change too much of this piece from one draft to the next except punctuation, grammar and spelling. I did, however, add a quote from *The Tao of Pooh*.

"Quotes from *The Tao of Pooh*" shows that I am able to pull out good and significant quotes from a book, understand them, and put them into my own words. Then I can make them understandable to other people. This piece gets the point across well and is easy to understand. I really only corrected spelling and punctuation from one draft to the next.

"Discrimination" shows me that I am learning more about discrimination and how it might feel (even though I have never experienced really bad discrimination). I found I can get my ideas across through realistic writing. This piece has good description and was well written for the assignment. Besides correcting some punctuation and spelling, I changed some wording to make the story a little more clear.

For all three pieces, the mechanics of my writing tend to be fairly poor on my first draft, but that is because I am writing as thoughts come into my mind rather than focusing on details of grammar. Then my final drafts get better as I get comments and can turn my attention to details of writing.

The four most important things that I'm able to do as a writer are to: 1) get thoughts pulled into a story; 2) have that story understandable and the reader get something from it; 3) have the reader remember it was a good piece of writing; and 4) like the piece myself.

Ann Shump

and evaluates the writing samples he has included in a portfolio for his eighth-grade language arts class; he has included two or more drafts of each piece of writing to show how he has improved each one over time. Self-reflections encourage students to look at and judge their own work in ways that teachers typically do, thereby promoting the self-monitoring and self-evaluation skills so essential for self-regulated learning (Arter & Spandel, 1992; Johnson et al., 2006; Vucko & Hadwin, 2004).

Types and Purposes of Portfolios

Portfolios take a variety of forms. Following are four types commonly used in school settings:

- *Working portfolio*—Shows competencies up to the present time; is dynamic in content, with new artifacts that show greater proficiency gradually replacing older, less skillful ones.
- *Developmental/Growth portfolio*—Includes several artifacts related to a particular set of skills; shows how a student has improved over time.
- *Course portfolio*—Includes assignments and reflections for a single course; typically also includes a summarizing reflection in which the student identifies general accomplishments in the course.
- *Best-work portfolio*—Includes artifacts intended to showcase the student's particular achievements and unique talents. (Johnson et al., 2006; Spandel, 1997)

These categories aren't necessarily mutually exclusive. For example, a course portfolio might have a developmental component, showing how a student has improved in, say, persuasive writing or graphic design over the year. And a best-work portfolio may be a work-in-progress for quite some time, thereby having the dynamic nature of a working portfolio.

Some portfolios are most appropriate for formative assessment, whereas others are appropriate for summative assessment. Developmental portfolios can show whether students are making reasonable progress toward long-term instructional goals; as such, they're often best used for formative assessment. Best-work portfolios are better suited for summative assessment; for example, they might be used to communicate students' final accomplishments to parents, school administrators, college admissions officers, or potential employers.

Benefits and Limitations of Portfolios

Portfolios have several benefits, some of which we've already identified:

- They capture the multifaceted nature of students' achievements, with a particular emphasis on complex skills.
- They can show growth over time—something that a single assessment at a single time can't do.
- They can demonstrate students' performance in real-world, authentic activities (e.g., science experiments, service learning projects).
- They provide practice in self-monitoring and self-evaluation, thereby enhancing students' self-regulation skills.
- They give students a sense of accomplishment and self-efficacy about areas that have been mastered, while possibly also indicating areas needing improvement.
- They provide a mechanism through which teachers can easily intertwine assessment with instruction: Students often include products that their teachers have assigned primarily for instructional purposes.
- Because the focus of portfolios is on complex skills, teachers are more likely to *teach* those skills. (Banta, 2003; Darling-Hammond et al. 1995; DiMartino & Castaneda, 2007; Johnson et al., 2006; Paulson et al., 1991; Spandel, 1997).

RSVP characteristics are often a source of concern with portfolios, however, especially if they're used to evaluate—rather than simply communicate—students' learning and achievement (Arter & Spandel, 1992; Banta, 2003; Haertel & Linn, 1996; Johnson et al., 2006). When portfolios must be scored in a holistic manner, the scoring is often unreliable, with different teachers rating them differently. In addition, there's an obvious standardization problem, because their contents can vary considerably from one student to another. Validity may or may not be an issue: Some portfolios may include enough work samples to adequately represent what students have accomplished relative to instructional goals, but others may be unrepresentative. And because portfolios take a great deal of teacher time, they're less practical than other methods of summarizing achievement. All of this isn't to say that we should shy away from using portfolios, but rather that we should be sure the potential benefits outweigh the downsides. Moreover, we must interpret them cautiously if we use them as summative reflections of what students have accomplished.

Keep in mind the limitations of portfolios with respect to the RSVP characteristics.

Helping Students Construct Portfolios

Creating a portfolio is typically a lengthy process that stretches out over several weeks or months; some best-work portfolios evolve over several years. So as not to overwhelm students by such a complex undertaking, it's often helpful to break the portfolio-construction process into a series of steps, scaffolding students' efforts at each step:

1. *Planning:* Decide on the purpose(s) the portfolio will serve (e.g., which instructional goals and/or content-area standards it will address and whether it will be used primarily for formative or summative assessment); identify a preliminary plan for creating the portfolio.
2. *Collection:* Save artifacts that demonstrate progress toward or achievement of particular goals and standards.
3. *Selection:* Review the saved artifacts and choose those that best reflect achievement of the specified goals and standards.
4. *Reflection:* Write explanations and self-evaluations of each artifact; describe how the artifacts show current competencies and growth over time; relate achievements to previously identified goals and standards.
5. *Projection:* Identify new goals toward which to strive.
6. *Presentation:* Share the portfolio with an appropriate audience (e.g., classmates, parents, college admissions officers). (Six steps based on Johnson et al., 2006.)

Break the construction of portfolios into a sequence of several manageable steps.

The Into the Classroom feature "Summarizing Students' Achievements with Portfolios" offers and illustrates several suggestions for scaffolding students' efforts in creating portfolios.

Into the Classroom

Summarizing Students' Achievements with Portfolios

Identify in advance the specific purpose(s) for which a portfolio will be used.

A third-grade teacher and her students agree to create portfolios that will show parents and other family members how much their writing skills have improved over the school year. Throughout the year students save their fiction and nonfiction work, and eventually they choose pieces that best demonstrate mastery of some writing skills and progress on other skills. The children proudly present their portfolios at parent–teacher–student conferences at the end of the year.

Align portfolio contents with important instructional goals and/or content-area standards.

At a high school in Ohio, twelfth graders complete graduation portfolios with three components, each of which reflects one or more of the school's instructional goals for all graduates:

- A lifelong-learning skills section shows mastery of a student's key skills in writing, math, science, and at least one other content domain.

- A democratic citizenship section provides specific examples of how a student has been actively engaged in issues related to the local community or larger society (e.g., by contributing to a public service activity).
- A career-readiness section contains a résumé, letters of recommendation from teachers or other adults, and other documents that show preparedness for post-secondary education or the workplace.

Ask students to select the contents of their portfolios; provide the scaffolding they need to make wise choices.

A fifth-grade teacher meets one-on-one with each of his students to help them choose artifacts that best reflect their achievements for the year. To give the students an idea of what they might include, he shows them several portfolios that students have created in previous years. He shares only those portfolios that previous students and parents have given him permission to use in this way.

Identify specific criteria that should guide students' selections; possibly include students in the criteria identification process.

A middle school geography teacher leads his class in a discussion of criteria that students might use to identify artifacts for a course portfolio. After reviewing the instructional goals for the course, the class agrees that the portfolio should include at least one artifact demonstrating each of the following:

- Map interpretation skills
- Map construction skills
- Understanding of interrelationships between physical environments and socioeconomic practices
- Knowledge of cultural differences within the nation
- Recognition that all cultures have many positive qualities

Have students include reflections on the products they include.

At the beginning of the school year, a ninth-grade journalism teacher tells students that they will be creating portfolios that show progress in journalistic writing during the semester. She asks them to save all of their drafts—"Even simple notes and sketchy outlines," she says. Later in the semester, as students begin to compile their portfolios, she asks them to look at their various drafts of each piece and to describe how the progression from one draft to the next shows their gradual mastery of journalistic skills. She occasionally assigns these reflections as homework so that students spread the portfolio construction task over a four-week period and therefore don't leave everything until the last minute.

Give students a general organizational scheme to follow.

When a high school requires students to complete portfolios as one of their graduation requirements, students get considerable guidance from their homeroom teachers. These teachers also provide a handout describing the elements each portfolio should include: title page, table of contents, introduction to the portfolio's contents and criteria guiding artifact selection, distinct sections for each content domain included, and final reflection summarizing achievements.

Determine whether a physical format or electronic format is more suitable for the circumstances.

At a high school that places particular emphasis on visual and performing arts, students create electronic portfolios that showcase their talents in art, drama, dance, and/or instrumental music. They take digital photos, make audio and video recordings of their projects and performances, and they create documents that describe and evaluate each one. They then divide their electronic documents into several logical categories, each of which they save (e.g., in an electronic folder, on a school-owned server, or on a website or cloud service).

When using portfolios for summative assessments, develop a rubric to guide evaluation.

At a high school in New York City, a key instructional goal is for students to acquire certain dispositions and thinking processes—which the school collectively calls *habits of mind*—in their academic work. One of these habits of mind is the use of credible, convincing evidence to support statements and positions. The school develops a four-point rating scale to evaluate students' work on this criterion. A score of 4 is given to work that reflects "Generalizations and ideas supported by specific relevant and accurate information, which is developed in appropriate depth." At the other end of the scale, a score of 1 is given to work that reflects "Mostly general statements; little specific evidence relating to the topic."

SOURCES: Darling-Hammond et al., 1995, p. 39 (New York City high school example); DiMartino & Castaneda, 2007 (Ohio high school example); Johnson et al., 2009; Johnson et al., 2006; Paulson et al., 1991; Popham, 2014; Spandel, 1997; Stiggins & Chappuis, 2012.

Standardized Tests

Learning Objective 15.3 Describe four general kinds of standardized tests, and explain how you might appropriately use and interpret these various tests.

Standardized tests are developed by test construction experts and published for use in many different schools and classrooms. Standardized tests are *standardized* in several ways: All students receive the same instructions, have the same time limits (unless they have an IEP that allows them to have extra time), respond to the same (or very similar) questions, and have their responses evaluated relative to the same criteria. These tests typically come with manuals that include the exact instructions to give students, the time limits to impose, and explicit scoring criteria to use. If the tests are norm-referenced—and many of them are—their manuals usually provide norms for various age or grade levels. Also, the manuals often provide information about test reliability for various populations and age groups, as well as information from which we can draw inferences about test validity for our own situation and purposes.

Types of Standardized Tests

School districts use four kinds of standardized tests fairly frequently: tests of achievement, general scholastic aptitude and intelligence, specific aptitudes and abilities, and school readiness.[2]

Achievement Tests Standardized achievement tests are designed to assess how much students have learned from what they've specifically been taught. The test items are intended to reflect the curriculum common to most schools. Many of these tests yield norm-referenced scores, although some tests now also yield criterion-referenced scores tied to particular national or state standards. The overall test scores reflect achievement in a broad sense: They tell us how much a student has learned in general about, say, mathematics or language mechanics—and perhaps whether the student has mastered certain basic skill areas—but won't necessarily give us information related to specific instructional objectives (e.g., multiplication of fractions or correct usage of uppercase versus lowercase letters).

Standardized achievement tests are useful in two primary ways. First, they can tell us how well our own students' achievement compares with that of students elsewhere—information that may indirectly tell us something about the effectiveness of our instruction. Second, they help us track students' general progress over time and alert us to potential trouble spots. For example, imagine that Carter gets average test scores year after year but then suddenly performs well below average in the ninth grade, even though the test and norm group are the same as in previous years. At this point we would want to ascertain whether the low performance is a temporary fluke—perhaps Carter was sick on the test day—or, instead, due to more enduring factors that require attention.

Most standardized achievement tests are highly reliable; that is, they lead to fairly consistent results for individual students, especially for students in the upper elementary and secondary grades. However, our main concern whenever we assess achievement is *content validity*, which we need to determine for *our own situation*. We can determine the content validity of a standardized achievement test by comparing a table of specifications—one provided in the test manual or one we construct ourselves by analyzing the test items—to our own curriculum. A test has high content validity only if the topics—*and also* the thinking skills—emphasized in test items match our curriculum, instructional goals, and content-area standards.

Determine the content validity of a standardized achievement test for your own curriculum, instructional goals, and content-area standards.

General Scholastic Aptitude and Intelligence Tests Whereas achievement tests are designed to assess how much students have specifically learned from what they've presumably been taught, **scholastic aptitude tests** are designed to assess a general *capacity* to learn. Traditionally, many of these tests have been called *intelligence tests*. However, some experts shy away from the latter term, in part because researchers don't agree about what intelligence *is* and in part because many people mistakenly believe that IQ scores reflect inherited ability almost exclusively. Other commonly used terms are *general aptitude test*, *school ability test*, and *cognitive ability test*.

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[2] You can find examples of popular standardized tests at the websites for McGraw-Hill Education (mheducation.com/prek-12/home-guest.html), Pearson (pearsonassessments.com), and Houghton Mifflin Harcourt (hmhco.com/classroom-solutions/assessment).

Regardless of what we call them, tests that fall into this category are used mainly for prediction—that is, to estimate how well students are likely to learn and perform in future academic situations. Typically, these tests are designed to assess how much students have learned and deduced from their general, everyday experiences. For example, they may assess understanding of vocabulary words that most students are likely to have encountered at one time or another. They may include analogy items intended to assess how well students can recognize similarities among well-known relationships. Most of them include measures of general knowledge and tasks that require deductive reasoning and problem solving.

You can learn more about intelligence tests and IQ scores in Chapter 5.

Like standardized achievement tests, scholastic aptitude tests tend to be quite reliable, especially for older students. Of greater concern, however, is their *predictive validity*—the accuracy with which they can help us estimate students' future achievement levels. Their predictive validity for future academic success varies considerably depending on the situation and population at hand, but in general you should think of these tests as providing only rough estimates of how students are likely to perform in school in the next two or three years; they're even *less* accurate in predicting students' academic and professional success over the long run. Keep in mind, too, that many factors not measured by these tests—for instance, motivation, self-regulation skills, and the quality of instruction—also influence students' learning and classroom performance (Dai, 2010; Duckworth & Seligman, 2005; Kuhn, 2001; Perkins et al., 2000).

Specific Aptitude and Ability Tests General scholastic aptitude tests are useful when we want to predict overall academic performance. But when we're interested in how well students are apt to perform in a particular content domain (e.g., math, music, or auto mechanics), **specific aptitude tests** are more useful. Some aptitude tests are designed to predict future performance in just one content domain. Others, called *multiple aptitude batteries*, yield subscores for a variety of domains simultaneously.

Specific aptitude tests are sometimes used to identify students who are most likely to benefit from certain domain-specific instructional programs (e.g., advanced math or science classes). They may also be used for counseling students about future educational plans and career choices. But two caveats are important to keep in mind when using these tests for such purposes. First, their predictive validity in academic contexts tends to be lower than that for general scholastic aptitude tests—that is, they yield only very rough estimates of students' future academic performance in the domain(s) in question. Second, they're based on the assumption that the ability being measured is a fairly stable one—an assumption that may or may not be accurate. Rather than trying to identify students with high aptitudes for particular subject areas, then, some educators argue that we should focus more on *developing* abilities in *all* students (Boykin, 1994; Nichols & Mittelholtz, 1997; Sternberg, 2002). Accordingly, specific aptitude tests now appear less frequently in wide-scale school testing programs than they once did.

School Readiness Tests A **school readiness test** is designed to determine whether children have acquired knowledge and skills essential for success in kindergarten or first grade—for instance, knowledge of colors, shapes, letters, and numbers. When used in combination with other information, school readiness tests can be helpful if we're looking for significant developmental delays that require immediate attention (Bracken & Walker, 1997; Lidz, 1991). On their own, however, they have limited predictive validity: The scores they yield typically correlate only moderately with children's academic performance even a year or so later (Duncan et al., 2007; La Paro & Pianta, 2000; Sanders, 1997; Stipek, 2002).

School readiness tests can often give us an idea of where to begin instruction with particular children. But as a general rule, we should *not* use them to identify children who should postpone formal schooling. By age 5 almost all children are probably ready for some form of structured educational program. Rather than focus on determining which children might have trouble in a particular educational curriculum and environment, we better serve children when we determine how to adapt the curriculum and environment to fit each child’s developmental progress and particular needs (Farran, 2001; Lidz, 1991; Stipek, 2002).

Table 15.2 summarizes the four categories of standardized tests just described.

Use the results of school readiness tests only for instructional planning—*not* for making decisions about which children are ready to begin school.

Individual versus Group Administration of Standardized Tests

Some standardized tests are administered one on one. Such tests enable the examiner to observe a student’s attention span, motivation, and other factors that may affect academic performance. For this reason, individually administered tests are typically used when identifying cognitive disabilities and other special educational needs.

When circumstances call for giving *all* students a standardized test, testing them as a group is usually the only practical approach. Fortunately, technology comes to our assistance in two distinct ways. For one thing, computers are routinely used to score a group test and generate reports about each student’s performance. In addition, some tests come in computer or tablet-based formats rather than written form. Computer-based standardized testing can provide several options that are either impractical or impossible with written tests:

- It allows **adaptive testing**, which adjusts the difficulty level of items as students proceed through a test and can thereby zero in on students’ specific strengths and weaknesses fairly quickly and accurately (Martin & Lazendic, 2018).
- It can include animations, simulations, videos, and audio messages—all of which can expand the kinds of knowledge and skills that test items assess.
- It enables assessment of how students approach specific problems and how quickly they accomplish specific tasks.
- It allows the possibility of assessing students’ abilities under varying levels of support (e.g., by providing one or more hints as needed to guide students’ reasoning).
- It can provide on-the-spot scoring and analyses of students’ performance.

Computer-based standardized tests tend to have reliability and validity levels similar to those of traditional tests, although some studies suggest that students perform better on written tests, compared to computer-based standardized tests (Bennett et al., 2008; Herold, 2016). Their use should, of course, be limited to students who are familiar and comfortable with computers and have adequate keyboarding skills (Gullen, 2014).

COMPARE/CONTRAST

Table 15.2 Commonly Used Standardized Tests

Kind of Test	Purpose	Recommendations
Achievement tests	To assess how much students have learned from what they have been taught	Use these tests primarily for assessing broad areas of achievement rather than specific knowledge and skills.
Scholastic aptitude and intelligence tests	To assess students’ general capability to learn; to predict their general academic success over the short run	Use test scores as rough predictors of performance in the near future, *not* as predictors of learning potential over the long run. Use tests designed for one-on-one administration if (a) a student’s verbal skills are limited, (b) exceptional giftedness or a significant disability is suspected, or (c) a student has insufficient self-regulation skills to stay on task during testing.
Specific aptitude and ability tests	To predict how easily students are likely to learn in a specific content domain	Use test scores as rough predictors of performance in the near future, *not* as predictors of learning potential over the long run. Because predictive validities for many of these tests are low, use test scores only in combination with other information about students.
School readiness tests	To determine whether young children have the prerequisite skills to be successful in a typical kindergarten or first-grade curriculum	Use test results only in combination with other information. Use test results for instructional planning, *not* for deciding whether students are ready to begin formal schooling.

Guidelines for Choosing and Using Standardized Tests

As teachers, we may sometimes have input into the selection of standardized tests for our districts, and we'll often be involved in administering them. Following are guidelines for choosing and using a standardized test appropriately:

- *Choose a test with high validity for your particular purpose and high reliability for students similar to your own.* We've examined four categories of standardized tests as if they're four distinctly different entities, but in fact the differences among them aren't always clear-cut. To some extent, all of these tests assess what a student has already learned, and all of them can be used to predict future performance. Our best bet is to choose the test that has the greatest validity for our particular purpose, regardless of what the test might be called. We also want a test that has been shown to be highly reliable with a population similar to ours.
- *Make sure that the test's norm group is relevant to your own population.* Scrutinize the test manual's description of the norm group used for the test, with questions like these in mind:
  - Does the norm group include students of the same ages, educational levels, and cultural backgrounds as those of your own students?
  - Are different norm scores provided for different genders? If so, consider how to use this information with students who identify as non-binary.
  - Is it a representative sample of the population at large or in some other way appropriate for any comparisons you plan to make?
  - Have the normative data been collected recently enough that they reflect how students typically perform in the current year?

  When we determine norm-referenced test scores by comparing students with an *in*appropriate norm group, the scores are meaningless. For example, one of us authors recalls a situation in which teacher education students at a major state university were required to take basic skills tests in language and math. Because the tests had been normed on a high school population, the university students' performance was compared to that of high school seniors—a practice that made no sense whatsoever.
- *Take students' ages and developmental levels into account.* A variety of factors—such as motivation, self-regulation skills, and general energy level—affect students' performance on tests and other assessments. When these factors are relatively stable characteristics, they affect test validity. When they're temporary and variable from day to day (perhaps even hour to hour), they affect test reliability and thus also indirectly affect validity. Such sources of error in students' test scores and other assessment results are especially common in young children, who may have limited language skills, short attention spans, little motivation to do their best, and low tolerance for frustration. Furthermore, young children's erratic behaviors may make it difficult to maintain standardized testing conditions (Bracken & Walker, 1997; Messick, 1983; Wodtke, Harper, & Schommer, 1989).

  In adolescence, other variables can affect the validity of standardized test scores. For example, especially in high school, some students become quite cynical about the validity and usefulness of standardized tests. Thus, they may read test items superficially, if at all, and a few may complete answer sheets simply by following a certain pattern (e.g., alternating between A and B) or filling in bubbles to make pictures or designs (Paris et al., 1991). Table 15.3 describes these and other developmental differences affecting students' performance on standardized tests.

DEVELOPMENTAL TRENDS

Table 15.3 Characteristics Affecting Standardized Test Performance at Different Grade Levels

Grade Level	Age-Typical Characteristics	Example	Suggested Strategies
K–2	• Short attention span; significant individual differences in ability to stay focused on test items • Little intrinsic motivation to perform well on tests • Inconsistency in test performance from one occasion to another	Each spring, an elementary school conducts a “Kindergarten Roundup Day” at which it collects information about children who will be enrolling in kindergarten in the fall. Escorted by a parent, each child goes to various booths in the gym, where teachers conduct various short assessments of basic knowledge and emerging literacy skills. Some children willingly comply with the teachers’ instructions, but others are bouncy and have trouble staying on task.	• Don’t use school readiness tests to determine which children are “ready” for elementary school; instead, plan early school experiences that can prepare students for future academic learning. • Leave assessment for diagnostic purposes (e.g., to identify students with special needs) in the hands of trained professionals who have experience in assessing young children. • Don’t make long-term predictions about achievement on the basis of standardized test scores. • Use multiple measures when making decisions about students’ educational programs.
3–5	• Unquestioning acceptance of standardized tests as valid measures • Increasing ability to stay focused on test questions • Increasing facility with computer-scored assessments • Considerable variability in knowledge and use of effective test-taking strategies	Students in a fourth-grade class work quietly and diligently on a state achievement test. Most of them address the questions in the order they appear in the test booklet, and some students spend so much time on especially difficult items that they must leave many questions unanswered when the allotted time is up.	• Stress the value of standardized tests for tracking students’ progress and identifying areas in which students may need extra instruction and support. • Give students plenty of practice using computer-administered assessments. • Explicitly teach basic test-taking strategies (e.g., skipping difficult test items and returning to them later if time allows).
6–8	• Increase in debilitating test anxiety (for some students) • Continuing variability in testwiseness • Emerging skepticism about the value of standardized tests (for some students)	When a middle school teacher announces an upcoming national achievement test, a few students argue that it will be a “complete waste of time” and insist that they won’t take it seriously.	• Explain that standardized tests provide only a general indication of what students know and can do; reassure students that test results won’t be the only things affecting instructional decision making. • Encourage students to do their best on a test; assure them that test results will be used not to judge them but rather to help them learn more effectively. • Provide some practice in test-taking skills, but remember that students’ performance depends more on their knowledge and abilities in content domains than on their general test-taking ability.
9–12	• Increasing cynicism about the validity and usefulness of standardized tests (especially common in low-achieving students) • Decreasing motivation to perform well on standardized tests; in some instances may reflect self-handicapping as a way of justifying poor performance	After a high school teacher has passed out test booklets, read the instructions, and started her stopwatch, one student puts down his pencil, slouches back in his chair, and looks absentmindedly out the window. A few minutes later, he grabs his pencil and fills in bubbles on his answer sheet to spell his name: “JESSE.”	• Acknowledge that standardized tests aren’t perfect, but explain that they *can* help teachers and administrators assess school effectiveness and plan future instruction. • Be alert for signs that a student may intentionally subvert an assessment; speak privately with the student about their concerns and offer your support to enhance test performance.

SOURCES: Bracken & Walker, 1997; Carver, 2006; Dempster & Corkill, 1999; Johnson et al., 2009; Lidz, 1991; Messick, 1983; Paris et al., 1991; Petersen et al., 1990; Sarason, 1980; Scruggs & Lifson, 1985; Stipek, 2002.

- *Make sure that students are adequately prepared to take the test.* In most instances, we’ll want to prepare students ahead of time for a standardized test. Several more specific strategies are widely recommended:
  - Explain the general nature of the test and the tasks it involves (e.g., if applicable, mention that students aren’t expected to know all of the answers and that many students won’t have enough time to respond to every item).
  - Encourage students to do their best, but without describing the test as a life-or-death matter.
  - Give students practice with the test’s format and item types (e.g., demonstrate how to fill in electronically scored answer sheets).
  - Give suggestions about effective test-taking strategies; in other words, foster *testwiseness*. But don’t overdo it; remember that your time is best spent helping students master the content domain being assessed.
  - Encourage students to get a full night’s sleep and to eat a good breakfast before taking the test.

See Chapter 14 for more information on testwiseness.

- *When administering the test, follow the directions closely, and report any unusual circumstances.* Once a test session begins, we should follow the test administration procedures to the letter, distributing test booklets as directed, asking students to complete any practice items provided, keeping time faithfully, and responding to questions in the prescribed manner. If we don't replicate the conditions under which the norm group has taken a test, any norm-referenced scores derived from the test will be meaningless. When unanticipated events significantly alter the test environment (e.g., when electrical power unexpectedly goes out), they jeopardize the validity of the test results and must be reported. We should also make note of any students who are behaving in ways unlikely to lead to maximum performance—appearing exceptionally nervous, staring out the window for long periods, marking answers haphazardly, and so on (Miller et al., 2009).

Interpreting Standardized Test Scores

Computer-generated reports of students' performance on standardized tests can be detailed and complex. Some reports include data for a single assessment, whereas others may contain scores for several different content domains that were assessed; such a multi-domain test is often called a *test battery*. Test batteries may, for example, include assessment of both *verbal* tasks (those that depend heavily on language skills) and *nonverbal* tasks (those that involve numbers, pictures, or graphical configurations).

These reports at times may seem daunting because they often include a great deal of data. For example, a report for an individual student may include data on the student's overall performance on the entire test, as well as sub-scores for various domain-specific sub-tests. Reports also often include a number of different types of scores for each test or sub-test. For example, a report might include the number of correct responses given by the student (on the full test as well as for each sub-test), their percentile and stanine scores, age equivalent scores, and a variety of other scores. Despite the many numbers that standardized tests can yield, we must remember that students' scores on these tests are, at best, only *imprecise estimates* of what students generally know and can do, and they may have little or no validity for some students. We must be *extremely cautious*—and occasionally downright skeptical—in our interpretation of students' standardized test results, and we mustn't place too much stock in the *exact* scores that the tests yield. Following are three additional guidelines to keep in mind when interpreting and using standardized test scores.

Remember that despite the apparent precision of standardized test scores, these scores are, at best, only imprecise estimates of students' abilities, and for some students the scores may be way off target.

- *Have a clear and justifiable rationale for establishing any cutoffs for acceptable performance.* If we want to use test results to make *either–or* decisions—for instance, to determine whether a student should move to a more advanced math class or be exempt from a basic writing skills course—we must have a clear rationale for the cutoff scores we use. The process can be relatively easy for criterion-referenced scores, provided that they truly reflect mastery and non-mastery of the subject matter. It's far more difficult for norm-referenced scores: At what point does a student's performance become acceptable? At the 20th percentile? At a stanine of 6? Without more information about the knowledge and skills the scores represent, there's no easy way for determining a cutoff for acceptable scores.
- *Compare two standardized test scores only when the scores have been derived from the same or equivalent norm group(s).* Different standardized achievement test batteries almost always have different norm groups; for example, scores on the Stanford Achievement Test Series are derived from comparisons with one particular norm

group, whereas scores on another widely used battery, the Woodcock-Johnson Tests of Achievement, are based on another norm group. We can compare students' performance on two achievement tests—say, their performance on a reading test with their performance on a math test—*only* when the tests are parts of the same test battery.

- *Never use a single test score to make important decisions.* No test—no matter how carefully constructed and widely used—has perfect reliability and validity. Every test is fallible, and students may do poorly on a test for a variety of reasons. Thus, we should never—note the word *never*—use a single assessment instrument or a single test score to make important decisions about individual students. Nor should we use single test scores to make important decisions about large groups of students or about the teachers who teach them, for reasons we'll identify in the next few pages.

High-Stakes Testing and Teacher Accountability

Learning Objective 15.4 Explain how high-stakes testing and teacher accountability practices can affect instruction and classroom learning, and suggest several strategies for enhancing the benefits of these practices.

In recent decades, a great deal of emphasis—almost certainly *too much* emphasis—has been placed on students' performance on standardized achievement tests. Many policy makers, business leaders, and other influential individuals routinely cite low scores on standardized tests as evidence of low achievement levels in our public schools.

Some students do seem to progress through several grade levels without acquiring basic skills in reading, writing, and math; a few graduate from high school without such skills. To address these problems, many states and school districts now use students' performance on tests or other assessments as a basis for promotion to the next grade level or awarding of high school diplomas. Typically, educators begin by identifying certain instructional goals or standards that students' final achievement should reflect. They then assess students' performance levels at the end of instruction, and only those students whose performance meets the predetermined goals and standards move forward. You might see such labels as *minimum competency testing* and *outcomes-based education* used for this approach.

Whenever we use a single assessment instrument to make major decisions about students, we're using a **high-stakes test**. Because high-stakes tests are typically used to make judgments about *mastery* of school subject matter, they require criterion-referenced rather than norm-referenced scores. For example, a high-stakes test might yield a score such as "In progress," "Proficient," or "Advanced" with respect to a student's knowledge and skills in a particular subject area.

Sometimes students' scores on high-stakes tests are used to make important decisions not only about students but also about the students' *teachers*. For example, teachers whose students score at exceptionally high levels at the end of the school year might get higher pay raises than their colleagues, whereas teachers whose students perform poorly might find themselves without a teaching job the following year. Whenever teachers are evaluated on the basis of how their students perform on achievement tests, we're talking about **teacher accountability**. Although the use of standardized test scores to evaluate the effectiveness of schools and teachers was limited during the Covid-19 pandemic, the use of such assessments to evaluate teachers and schools is on the rise once again (Sawchuk, 2022).

The Every Student Succeeds Act

Testing and accountability for student learning in the United States was largely dictated by the federal **No Child Left Behind Act** of 2001, until the **Every Student Succeeds Act (ESSA)** was passed in 2015. Some of the highlights of ESSA include:

- A mandate to implement educational practices, strategies, and programs that meet the legislation's requirements for having been proven effective.
- A requirement that all students receive a high-quality education that will prepare them for postsecondary education and future careers.
- Required annual statewide assessments (during grades three through eight and once during high school), to ensure that students are meeting academic standards; control of these assessments largely rests with individual states.
- Necessitates accountability and implementation of change strategies to improve the lowest performing schools.

SOURCES: Center for Research and Reform in Education, 2018; U.S. Department of Education, 2018.

Problems with High-Stakes Testing

Experts have identified several problems with the use of high-stakes tests to make decisions about students, teachers, and schools.

- *The tests don't always reflect important instructional goals.* High-stakes achievement tests don't always have good content validity for the contexts in which they're used. Even if well-constructed, they may reflect only a small portion of a school's curriculum and instructional goals. The preponderance of multiple-choice and other objectively scorable items on many standardized tests limits the extent to which these tests assess complex cognitive skills and performance on authentic, real-world tasks (Hursh, 2007; Jones et al., 2003; Leu et al., 2009; Mintrop & Sunderman, 2009; Thomas, 2005).
- *Teachers spend a great deal of time teaching to the tests.* When teachers are held accountable for their students' performance on a particular test, many of them understandably devote many hours to the topics and skills the test assesses, and students may focus their studying accordingly. The result is often that students perform at higher levels on a high-stakes test *without* improving their achievement and abilities more generally. If a test truly measures the things that are most important for students to learn—including problem solving, critical thinking, and other complex thinking skills—then focusing on those things is quite appropriate. But if the test primarily assesses only rote knowledge and simple skills, it can undermine the achievement gains we *really* want to see (Au, 2007; Finn et al., 2014; Jennings & Bearak, 2014; Quellmalz et al., 2013; Salloum & BouJaoude, 2019).

Teach to the test if—and *only* if—it reflects important instructional goals.

Sometimes, high-stakes tests are based on lengthy lists of prescribed competencies or standards—far too many for most students to master in a single school year. Thus, teachers may try to cover many topics quickly, without giving students sufficient time and instruction to master them. As one eighth-grade math teacher put it when her class was facing a statewide math competency exam, "Mastery probably isn't possible at this point, but I should at least *present* what students need to know. Maybe this will help a few of them with some of the test items." Such superficial coverage is common when maximizing students' scores on high-stakes tests must be at the top of teachers' priority lists (Au, 2007; La Guardia, 2009; Plank & Condliffe, 2013; Valli & Buese, 2007).

- *Teachers and schools may focus much of their attention on helping some students while shortchanging others.* The focus of many state- and district-level assessment policies is on maximizing the number of students who meet certain minimal criteria for acceptable performance. Within such a context, the key to doing well as a school is to push as many low-achieving students as possible over the minimal cutoff for success. In the process, students who fall way below the cutoff and students who are already well above it may be given short shrift; for instance, schools may devote little instructional time or resources to students who are most in need of them (Balfanz et al., 2007; Ho, 2008; Porter & Polikoff, 2007).

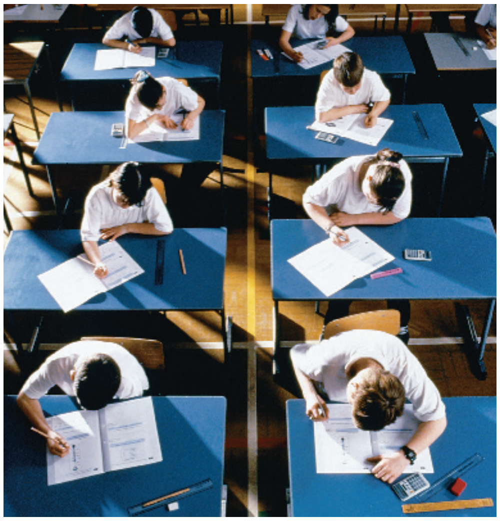
- *School personnel have disincentives to follow standardized testing procedures and to assess the achievement of chronically low performers.* In a high-stakes situation, teachers and administrators sometimes conclude that *dis*honesty is the best policy. Imagine that, as a teacher or school administrator, you want to maximize your school's average test scores. Might you give students more than the allotted time to finish the test? Might you provide hints about correct answers or possibly even *give* students the correct answers? Might you find reasons to exempt certain students from taking the test—perhaps finding a place for them in a special education program or retaining them at a grade level where they won't be assessed? Such practices can occur when teachers and administrators are under pressure to raise a school's average test scores (Hursh, 2007; Mintrop & Sunderman, 2009; Robinson & Simonton, 2020; Ryan & Brown, 2005; Thomas, 2005).
- *Different criteria lead to different conclusions about which students and schools are performing at high levels.* When we base teacher retention, salary increases, school funding, and other incentives on students' test performance, what specific criterion do we use? A predetermined, absolute level of achievement? Improvement over time? Superior performance relative to other school districts? There's no easy answer to this question. Yet depending on which criterion we use, we'll reach different conclusions as to which students, teachers, and schools are and are not performing well. Compounding the problem is the fact that students in lower-income communities achieve at lower levels, on average, than those in higher-income communities even when both groups have excellent teachers and instructional programs (Anderman et al., 2015; Ballou et al., 2004; Mintrop & Sunderman, 2009).
- *Too much emphasis is placed on punishing seemingly low-performing teachers and schools; not enough is placed on helping them improve.* Many advocates of school reform think that a quick, easy "fix" to low achievement levels is simply to reward teachers and schools whose students do well and to punish those whose students do poorly. This strategy is unlikely to be effective, especially if some of the factors affecting students' academic performance (health, family support, peer group norms, etc.) are beyond teachers' and administrators' control. In fact, there's *no* convincing evidence that simply holding school faculty accountable for students' performance on high-stakes assessments—without also providing sufficient support to make change possible—has a significant positive influence on teachers' instructional strategies or on students' learning and achievement. Furthermore, the threat of harsh consequences for insufficient improvements in test scores can adversely affect teachers' morale and lead some teachers, including some very good ones, to leave teaching altogether (Brown & Clift, 2010; Finnigan & Gross, 2007; Forte, 2010; Stringfield & Yakimowski-Srebnick, 2005).
- *Students' motivation affects their performance on the tests, and consistently low test performance can, in turn, affect their motivation.* For a variety of reasons—perhaps because of low self-efficacy or external, uncontrollable attributions for academic achievement—some students have little motivation to do well on high-stakes tests, and others become so anxious that they *can't* do as well as they should (Chabrán, 2003; Siskin, 2003). Furthermore, when students get consistently low test scores—and especially when their scores pose obstacles to promotion and graduation—they may see little point in staying in school. Thus, the use of high-stakes tests for high school graduation doesn't necessarily increase students' achievement levels. Instead, it can increase school dropout rates, especially for students from certain ethnic minority groups and students from low-income neighborhoods (Holme et al., 2010; Jones et al., 2003; Kumar et al. 2002; Plunk et al., 2014; Ryan & Brown, 2005).

Productive Steps Forward in High-Stakes Testing

Public concern about students' achievement levels in elementary and secondary schools isn't going away any time soon, nor should it. Many students *are* achieving at low levels, especially those in low-income school districts and those with special educational needs. Moreover, disruptions to schooling due to the Covid-19 pandemic have led many schools to reconsider the value of high-stakes testing, particularly since many students experienced learning losses during this time (National Education Association, 2021). Hence, we authors offer several potential solutions that, in combination, may help to alleviate the problems with high-stakes testing just identified.

- *Assess those things most important for students to know and do.* If we're going to make important decisions about students, teachers, and schools based on assessment results, we must be sure we're assessing aspects of achievement most critical for students' long-term success. For instance, students should not only acquire basic skills in literacy, math, and science but also gain a solid understanding of how their government works, what social factors affect the welfare and behaviors of their fellow human beings, and how they can productively use their leisure time and contribute to the general betterment of society (Thomas, 2005). We shouldn't pretend that assessing such things is easy, but it's essential if we're going to rely on assessment results to determine whether schools are truly meeting students' long-term needs.
- *Educate the public about what standardized tests can and cannot do for us.* What we authors have recently seen and heard in the media leads us to think that many public figures and policy makers overestimate how much standardized achievement tests can tell us: They assume that such instruments are highly accurate, comprehensive measures of what students know and can do. True, these tests are usually developed by experts in test construction, but no test is completely reliable, and its validity will vary considerably depending on the context in which it's being used. It behooves all of us—whether we're teachers, school administrators, parents, or simply members of the general public—to learn about the limitations of standardized tests and educate our fellow citizens accordingly.
- *Consider alternatives to traditional or computer-delivered tests.* When a test will be administered to many students at once, it's likely to consist largely of easily scorable item formats such as multiple-choice questions. Well-constructed multiple-choice tests certainly have the capacity to assess complex cognitive skills, but they inevitably limit how effectively we can assess certain skill areas, such as writing. Thus, some experts argue that we should use authentic assessments either instead of, or in addition to, more traditional tests (e.g., Baker, 2007; DiMartino, 2007; Shepard et al., 2005). We should be aware, however, that states and school districts that have used authentic, performance-based assessments on a large scale have encountered problems with reliability and validity. As a society, then, we must tread cautiously as we move in this direction.
- *Advocate for the use of multiple measures in any high-stakes decisions about students.* No matter what kind of assessment techniques we use, no single technique is likely to give us a comprehensive picture of what students have learned. Even if a single assessment could give us such a picture, perfect reliability is an elusive goal: Students' test results are inevitably subject to temporary swings in motivation, attention, mood, health, and other factors. To base life-altering decisions about students on a single test score is unconscionable.

As teachers, we must help educate the public about the limitations of standardized tests, especially those that are used in making important decisions about students and instructional programs.



Steve Lyne/Shutterstock

- *If tests are being used to measure teacher effectiveness, advocate for a focus on academic improvement rather than on age-group averages.* If test results are going to be used to measure teacher and school effectiveness, then assessing the degree to which each student makes progress during the school year may be a reasonable approach. You may sometimes see the term **value-added assessment** used in reference to progress-based evaluation of teachers and schools.

Unfortunately, assessing students' improvement over a single school year isn't as easy as it might seem, especially when we're using standardized achievement tests. We can't just find the difference between beginning-of-year and end-of-year test scores and say, "Hey, Mr. French's students showed bigger gains than Ms. Anderson's students did, so Mr. French must be the better teacher." For one thing, if we calculate the mathematical difference between two test scores with imperfect reliability and validity, the result will be a number with even *less* reliability and validity. Also, students can differ considerably in the *rates* at which they improve, with students from low-income families improving more slowly (on average) than their more economically advantaged peers. Furthermore, the particular school at which a teacher is working can have a major influence; for example, Mr. French might be teaching at a newly built facility with many resources and a highly motivated student body, whereas Ms. Anderson might be teaching in a dilapidated old building with inadequate supplies and little or no sense of school community among students and faculty. Statisticians have developed a variety of mathematical methods for taking such factors into account in calculating improvement scores, but none of them has yet emerged as a tried-and-true approach to measuring teacher effectiveness (e.g., see American Statistical Association, 2014; Anderman et al., 2015; Ballou et al., 2004; McCaffrey et al., 2003).

So where does all of this leave us with respect to teacher accountability? At this point, we authors strongly urge educators with decision-making powers to move away from relying mainly on large-scale achievement tests as the primary indicators of student progress and teacher effectiveness. Ideally, educators should instead identify concrete, realistic instructional goals for students in a single school year—perhaps tailoring those goals to local students' strengths and needs and breaking them down into more specific and manageable short-term goals—and create reasonable criterion-referenced tasks to assess goal accomplishment (Anderman et al., 2015).

Taking Student Diversity into Account

Learning Objective 15.5 **Explain how you might accommodate group differences and special educational needs in your efforts to summarize students' achievement.**

Whenever students take standardized tests, their performance can be affected by factors that aren't necessarily related to the characteristics the tests are intended to assess. If two students have *learned equally* yet *perform differently* on an assessment, the information obtained has **assessment bias** and questionable validity. We have a biased assessment whenever either the specific contents of items or the general behaviors and skills required to do well give some students an unfair advantage over others.

Cultural Bias in Test Content

One especially noteworthy form of assessment bias is **cultural bias**. An assessment instrument has cultural bias if any of its items either offend or unfairly penalize some students on the basis of their ethnicity, gender, socioeconomic status, religion, or other group membership (e.g., Buck et al., 2002, Popham (2014)). To get a sense of this phenomenon, try the following exercise.

Experiencing Firsthand

How Productive Will You Be?

Imagine that you're taking a test designed to estimate your general ability to make productive contributions to the society in which you live. Here are the first three questions on the test:

1. When you enter a hogan, in which direction should you move around the fire?
2. Why is turquoise often attached to a baby's cradleboard?
3. If you need black wool for weaving a rug, which one of the following alternatives would give you the blackest color?
    - **a.** Dye the wool with a mixture of sumac, ochre, and piñon gum.
    - **b.** Dye the wool with a mixture of indigo, lichen, and mesquite.
    - **c.** Use the undyed wool of specially bred black sheep.

Try to answer these questions before you read further.

Did you have trouble answering some or all of the questions? All three were written from the perspective of a particular culture—that of the Navajos. Unless you've had considerable exposure to this culture, you would probably perform poorly. The three answers are (1) clockwise, (2) to ward off evil, and (3) Alternative *a*—"Dye the wool with a mixture of sumac, ochre, and piñon gum" (Gilpin, 1968; Nez, 2011).

Is the test culturally biased? That depends. If the test is designed to assess your ability to succeed in a Navajo community, the questions might be quite appropriate. But if it's designed to assess your ability to accomplish tasks for which knowledge of Navajo culture is irrelevant, the questions have cultural bias.

Two points about cultural bias are important. First, the term includes biases related to *gender* and *socioeconomic status* as well as to culture and ethnicity. For example, consider the following hypothetical assessment items, one for a math test and the other for a test of writing skills:

1. As a member of his high school baseball team this year, Mark has hit the ball 17 times in the 36 times he's been at bat. Of those hits, only 12 got him safely to base; the other 5 were either fly balls or sacrifice bunts that resulted in outs. And in three of Mark's at-bats, poor pitches enabled Mark to walk to first base. Based on this information, calculate Mark's batting average for the year so far.
2. Would you rather swim in an ocean, a lake, or a swimming pool? Write a two-page essay defending your choice.

Question 1 assumes a fair amount of knowledge about baseball—knowledge that some students (especially boys) are more likely to have than other students. Question 2 would obviously be difficult for students who haven't gone swimming in all three situations and would be even more difficult for those who have never swum at all; students from low-income, inner-city families might easily fall into one of these two categories.

A second important point is that an assessment instrument is culturally biased if it *offends* a particular group. For example, imagine a test item that implies that girls are more intelligent than boys, and imagine another item that portrays people of a certain country in an unflattering light. Such questions have cultural bias because some students are likely to be offended by the items and thus may be distracted from doing their best. These students might also take the stereotypes to heart, which would adversely affect their sense of self.

An assessment instrument isn't necessarily biased simply because one group gets higher scores on it than another group. It's biased only if the groups' scores are different when the characteristic we're trying to measure *isn't* different for the groups or if the instrument has higher predictive validity for one group than for another. Yes, we may sometimes see group differences in students' scores on particular assessment instruments, but these differences often reflect inequities in students' backgrounds that will affect their future educational performance. For example, if, on average, high school boys are more likely than girls to earn extremely high scores on standardized math tests, the difference may be partly due to the fact that—again, on average—parents more actively encourage boys than girls to learn math (Bleeker & Jacobs, 2004; Halpern et al., 2007; Valla & Ceci, 2011). Similarly, if students from low-income families have had few opportunities to venture beyond their immediate neighborhoods (fewer trips to science museums, less educational travel to other states or countries), their more limited exposure to diverse environments is likely to impact both their test performance *and* their classroom achievement.

Most publishers of large-scale standardized tests employ individuals who represent numerous diverse ethnic and cultural groups and who actively screen test items for possible sources of cultural bias. Furthermore, most scholastic aptitude tests show similar predictive validity for various ethnic and cultural groups, provided that the members of those groups are native English speakers (Brown et al., 1999; Sattler, 2001; Zwick & Sklar, 2005). Nevertheless, any standardized test should be carefully scrutinized for any items that might be offensive to any gender or cultural group, as well as for items that might be more difficult for one group than another for reasons unrelated to the characteristic being measured. And, of course, we should continually be on the lookout for any unintentional cultural bias in the classroom assessment instruments that we construct ourselves.

Scrutinize assessment instruments carefully for tasks that some students might find offensive or might have difficulty answering solely because of their ethnic background, gender identification, or socioeconomic status.

Cultural and Ethnic Differences

Even when test content isn't culturally biased, traditional group-administered standardized tests—the kinds that involve time limits and electronically scored answers—put students from some cultural and ethnic backgrounds at a disadvantage. For example, timed tests that require answering many questions very quickly can be troublesome for Native American students whose communities have socialized them to carefully think and reflect before responding to questions (Tyler, Uqdah, et al., 2008). In addition, children from some sociocultural backgrounds may have little prior experience with questions to which the adult already knows the answer (Adger et al., 2007; Heath, 1989; Rogoff, 2003). In addition, debilitating test anxiety often is more common among culturally and ethnically diverse students (Carter et al., 2008; García & Pearson, 1994; Putwain, 2007). One possible contributor to this anxiety is a phenomenon known as **stereotype threat**, in which students from stereotypically low-achieving groups perform more poorly on classroom assessments than they otherwise would, simply because they're aware that their group traditionally *does* do poorly (Aronson & Steele, 2005; Osborne et al., 2010; Smith, 2004; Walton & Spencer, 2009).

See Chapters 4 and 11 for a more detailed explanation of stereotype threat.

For such reasons, less traditional assessment methods—perhaps dynamic assessment or portfolios—can often provide a more optimistic picture of minority-group students' achievements and abilities (Feuerstein et al. 2010; Haywood & Lidz, 2007; Johnson et al., 2006). When circumstances *require* traditional standardized assessments, students should have plenty of advance practice in taking them. To ease students' anxiety, we should encourage them to think of the tests as only rough measures of abilities that will almost certainly improve with future schooling and effort (e.g., Good et al., 2003).

See Chapter 14 for a description of dynamic assessment.

Language Differences and English Language Learners

The earlier section on cultural bias mentioned that most scholastic aptitude tests show similar predictive validity for various groups *provided that the members of those groups are native English speakers*. Without question, students' experience and facility with English affects their performance on English-based assessments of achievement and ability (Huerta et al., 2021; Kieffer et al., 2009; Solórzano, 2008). Poor reading and writing skills

When students' backgrounds put them at a disadvantage in traditional standardized tests, assess their achievements and abilities in other ways. If a standardized test is mandated, give students practice in taking that kind of test, and encourage them to think of the ability being measured as something that will improve with time and practice.

When students have limited proficiency in English, minimize the use of written or spoken English to assess knowledge and skills that are not primarily linguistic in nature.

are likely to interfere with success on standardized assessments, and poor speaking skills can adversely affect students' ability to perform well on oral exams. For example, students whose native language is Spanish perform better on math tests that are given in Spanish than on those administered in English (Robinson, 2010). For immigrant students in particular, "any test in English is a test *of* English" (Garcia, 2005).

A particular concern is the use of high-stakes tests with English language learners. When children have learned a language other than English at home, it typically takes them considerable time—perhaps 5 to 7 years—to gain sufficient proficiency in English to perform at their best in English-speaking classrooms (Cummins, 2008; Dixon et al., 2012; Padilla, 2006). Yet many school districts require these students to take high-stakes tests in English when they have only a superficial understanding of the language. Clearly, such practices lead to significant underestimations of English language learners' academic achievement—in other words, the test scores may have poor content validity for these students (Carhill et al., 2008; Forte, 2010; Huerta et al., 2021; Solórzano, 2008).

Following are examples of practices we should advocate for English language learners, especially in high-stakes situations:

- Translate a test into a student's native language.
- Let students use a dictionary or other appropriate reference tool.
- Administer a test one on one, perhaps eliminating time limits, presenting questions orally, and allowing students to respond in their native language.
- Use alternative assessment methods (e.g., dynamic assessment, portfolios) to document achievement.
- Exclude students' test scores when computing averages that reflect the overall achievement of a school or a particular subgroup within the school. (Haywood & Lidz, 2007; Huerta et al., 2021; Johnson et al., 2006; Kieffer et al., 2009; Solórzano, 2008; Wright, 2006)

Accommodating Students with Special Needs

We must keep students' unique needs and disabilities in mind whenever we want to assess their abilities and summarize their achievements. For example, if instructional goals for a student with a learning disability are different from those for general education classmates, our grading criteria should be altered accordingly, perhaps to be in line with the student's IEP. However, letter grades alone communicate very little information about what students have specifically learned and achieved; if we change the criteria for a particular student, the grades may communicate even *less* information. Portfolios—perhaps including teacher checklists, photographs, and audio and video recordings, as well as students' written work—can be quite helpful for conveying the progress and achievements of students with a variety of disabilities and special needs (Mastropieri & Scruggs, 2007; Venn, 2000).

We may also have to modify standardized testing procedures to accommodate students with special educational needs. In the United States, the Individuals with Disabilities Education Act (IDEA) mandates appropriate accommodations for students' disabilities. Such accommodations might involve one or more of the following:

- For a student with limited proficiency in English, administer assessments in their native language.
- Modify the presentation format of the assessment (e.g., using Braille or American Sign Language to present test items and other assessment tasks).
- Modify the response format (e.g., dictating answers, allowing use of a word processor).
- Modify the timing (e.g., giving extra time or frequent breaks).
- Modify the assessment setting (e.g., having a student take a standardized test alone in a quiet room).

- Administer only part of an assessment.
- Use instruments different from those given to classmates without disabilities, to be more compatible with students' ability levels and needs (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999).

We can often use students' IEPs for guidance about appropriate accommodations for each student. Table 15.4 offers additional suggestions for using standardized tests with students who have special needs.

Chapter 5 identifies specific categories of special needs that fall within the five general categories listed in Table 15.4.

Whenever we modify assessment instruments or procedures for students with special needs, we must recognize that there's a trade-off between two of our RSVP characteristics. On the one hand, we're violating the idea that an assessment should be standardized

STUDENTS IN INCLUSIVE SETTINGS

Table 15.4 Using Standardized Tests with Students Who Have Special Educational Needs

Category	Characteristics You Might Observe	Suggested Strategies
Students with specific cognitive or academic difficulties	• Poor listening, reading, and/or writing skills (for some students) • Tendency for test scores to underestimate overall achievement levels (if students have poor reading skills) • Inconsistent performance due to off-task behaviors, affecting reliability and validity of scores (for some students with learning disabilities or attention-deficit hyperactivity disorder) • Higher-than-average test anxiety	• Modify test administration procedures to accommodate disabilities identified in students' IEPs (e.g., when administering an essay test, allow students with writing disabilities to use a word processor and spell checker). • Have students take tests in a room with minimal distractions. • Make sure students understand what they're being asked to do. • Be sure students are motivated to do their best but not overly anxious about their performance. • Use classroom assessments (both formal and informal) to confirm or disconfirm results of standardized tests. • Record and report all modifications of standardized procedures.
Students with social or behavioral problems	• Inconsistent performance due to off-task behaviors or lack of motivation, affecting reliability and validity of scores (for some students)	• Modify test administration procedures to accommodate disabilities identified in students' IEPs (e.g., when students are easily distracted, administer tests individually in a quiet room). • Convince students that doing their best can in some way enhance their long-term well-being. • Use classroom assessments (both formal and informal) to confirm or disconfirm results of standardized tests. • Record and report all modifications of standardized procedures.
Students with general delays in cognitive and social functioning	• Slow learning and cognitive processing • Limited or nonexistent reading skills • Poor listening skills	• Choose assessments appropriate for students' cognitive abilities and reading and writing skills. • Minimize the use of assessments that are administered to an entire class at once; rely more on those that are administered one on one. • Make sure students understand what they're being asked to do.
Students with physical or sensory challenges	• Mobility problems (for some students with physical challenges) • Tendency to tire easily (for some students with physical challenges) • Less developed language skills, affecting reading and writing ability (for some students with hearing loss)	• Obtain modified test materials for students with visual impairments (e.g., large-print or Braille test booklets). • Modify test administration procedures to accommodate students' unique needs. • If reading and writing skills are impaired, read test items to students. • Break lengthy assessments into segments that can be administered on separate occasions. • Schedule tests at times when students feel rested and alert. • Record and report all modifications of standardized procedures. • Don't compare a student's performance to that of the norm group if significant modifications have been made.
Students with advanced cognitive development	• Greater interest and engagement in challenging tests • Tendency in some students to hide giftedness to avoid possible ridicule by peers • In some instances, ability levels beyond the scope of typical tests for the grade level	• Keep assessment results confidential. • When students consistently earn perfect or near-perfect scores (e.g., percentile ranks of 99), request individualized testing that can more accurately assess their very high ability levels. • Use dynamic assessments as an alternative to traditional ability tests to identify giftedness in students from diverse cultural or linguistic backgrounds.

SOURCES: Barkley, 2006; Beirne-Smith et al., 2006; Ford & Harris, 1992; Gottfried et al., 1994; Gregg, 2009; Haywood & Lidz, 2007; Mastropieri & Scruggs, 2007; Mercer & Pullen, 2005; Meyer, 2000; Phillips et al., 1980; Piirto, 1999; Pitoniak & Royer, 2001; Stein & Krishnan, 2007; Turnbull et al., 2010; Venn, 2000; Whitaker Sena, Lowe, & Lee, 2007.

with respect to content, administration, and scoring criteria. On the other hand, if we fail to accommodate the disabilities that some students have, we'll get results that have little validity. There's no magic formula for determining the right balance between standardization and validity for students with special needs. As teachers, we must use our best professional judgment—and perhaps also seek the advice of specialists—in each situation.

We must keep in mind, too, that modifying assessment instruments or procedures for a standardized test may render the test's norms irrelevant; hence, any norm-referenced scores we derive may be uninterpretable. When our purpose is to *identify* students' learning and performance difficulties, standardized testing procedures and norm-referenced scores are often quite appropriate. But when we're concerned about how to modify instructional methods and materials to *address* those difficulties, criterion-referenced scores and a close inspection of students' responses to particular tasks and items may be more helpful.

Keep in mind that published peer-group norms for a standardized test may no longer be applicable when the test is modified in a significant way.

Confidentiality and Communication about Assessment Results

Learning Objective 15.6 **Distinguish between circumstances in which you should and should not reveal students' assessment results, and explain how you can effectively communicate these results to students and parents.**

Students' test scores, class grades, and other assessment results should be confidential, as the following exercise can illustrate.

Experiencing Firsthand

How Would You Feel?

How would you feel if one of your instructors did the following?

- Returned test papers in the order of students' test scores, so that those with highest scores were handed out first, and you received yours *last*.
- Told your other instructors how poorly you had done on the test, so that they could be on the lookout for other stupid things you might do.
- Looked through your school records and discovered that you scored 87 on an IQ test you took last year and that a school-wide personality test you unknowingly also took has revealed some unusual sexual fantasies.

You'd probably be outraged if your instructor did *any* of these things.

But exactly *how* confidential should students' assessment results be? When should people know the results of students' assessments, and who should know them? In the United States, we get legal guidance on these questions from the **Family Educational Rights and Privacy Act (FERPA)**, passed by the U.S. Congress in 1974. This legislation limits normal school testing practices primarily to the assessment of achievement and scholastic aptitude—two things that are clearly within the school's domain. Furthermore, it restricts access to students' assessment results to the few individuals who really need to know them: the students who earn them, their parents, and school personnel directly involved with students' education and well-being. Assessment results can be shared with other individuals (e.g., a family doctor or a psychologist in private practice) *only* if the student (if at least 18 years old) or a parent gives written permission. Following are implications of this legislative mandate for classroom practices:

- We *cannot* ask students to reveal their political affiliation, sexual attitudes, illegal behaviors, potentially embarrassing psychological problems, or family income. (An exception: Questions about income to determine eligibility for financial assistance are allowed.)

- We *cannot* post test scores in ways that allow students to learn one another's scores. (For example, we can't post scores in alphabetical order or according to birthdays or social security numbers.)
- We *cannot* distribute papers in any way that allows students to observe one another's scores. (For example, we can't let students search through a stack of scored papers to find their own.)

Keep students' assessment results confidential; for example, don't post assessment results in ways that allow students to discover how their classmates have performed.

Many educators initially interpreted FERPA as forbidding teachers to have students grade one another's test papers. In 2002, however, the U.S. Supreme Court ruled that this practice doesn't violate FERPA because the test scores obtained aren't yet a part of students' permanent school records.[3] Nevertheless, although students can certainly give one another feedback on tasks used for formative assessment purposes, we authors strongly urge you *not* to have students swap and grade quizzes or other assessments that yield obvious high and low scores.

Keeping students' assessment results confidential makes educational as well as legal sense. Low scores can be a source of shame and embarrassment—and are even more so if classmates know about them—and thus can increase students' anxiety about future assessments. Students with high scores can also suffer from having the results made public: At many schools, it isn't cool to be smart and high achievers may perform at lower levels to avoid risking peer rejection. Also, publicizing students' assessment results focuses students' attention on performance goals—how they appear to others—rather than on mastering the subject matter. Even posting the distribution of test scores for students in your class (e.g., "5 A's, 12 B's, 4 C's, 3 D's, 1 F") can cause much unnecessary stress for students, and may even encourage them to cheat in order to avoid looking "dumb" (Anderman & Koenka, 2017).

In the opening case study, Ms. Davidson announces Amelia's grades to the entire class. The teacher's remarks violate FERPA, which applies to final grades as well as to individual assessments. Furthermore, making Amelia's grades public isn't in Amelia's best interest. Rather than motivate her to work harder (she's already highly motivated), it distresses her to the point that she no longer feels comfortable in Ms. Davidson's classroom.

An additional provision of FERPA is that parents and students (if at least 18 years old) have the right to review test scores and other school records. School personnel must present and interpret this information in a way that parents and students can understand.

Communicating Assessment Results to Students and Parents

Consider what happens when students in Ms. Ford's middle school math class learn that many of them have done poorly on a recent quiz:

Ms. Ford: If you received a grade below 75 you definitely have to work on it. I do expect this quiz to be returned with Mom or Dad's signature on it. I want Mom and Dad to be aware of how we're doing.

Student: No!

Student: Do we have to show our parents? Is it a requirement to pass the class?

Ms. Ford: If you do not return it with a signature, I will call home. (Turner et al., 1998, p. 741)

You can see more of this class discussion in the opening case study in Chapter 14.

Ms. Ford wants parents to know that their children aren't doing well in her class, but her approach has three drawbacks. First, many students may find it easier to forge an adult-like signature than to deliver bad news to a parent. Second, parents who do see their children's test papers won't have much information to help them interpret the results. (Are the low scores due to little effort? Poor study strategies? Poor instruction?) And third, Ms. Ford focuses entirely on the problem—low achievement—without offering suggestions for *solving* it.

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[3] *Owasso Independent School District v. Falvo*, 534 U.S. 426.

As teachers, we must think of ourselves as working in cooperation with students and parents for something that everyone wants: students' academic success. Our primary goal in communicating classroom assessment results is to share information that will help students achieve that end—something Ms. Ford neglects to do. Furthermore, because many students have done poorly on the test, Ms. Ford should consider whether something *she* has done—or not done—might account for the low scores. For instance, perhaps she allocated insufficient class time to certain concepts and skills, used ineffective strategies in teaching them, or constructed an exceptionally difficult test.

When we need to report standardized test results, we face a different challenge: How do we explain the results to students and parents who know very little about such tests and the kinds of scores they yield? Following are several guidelines that assessment experts offered many years ago (Durost, 1961; Ricks, 1959) but are still relevant today.

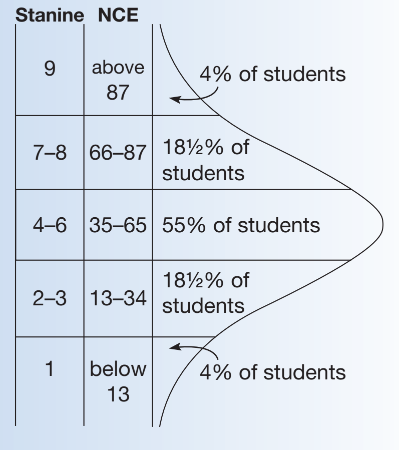
- *Make sure you understand the results yourself.* When conveying information about standardized test results, we need to know something about the test's reliability and validity for the situation in which we've used it. We also need to know the general nature of the test scores—for example, whether they're criterion-referenced or norm-referenced and, if norm-referenced, how to interpret them. One of us authors recalls a situation in which a teacher reported to a parent at a conference that a child's test score was at the 85th percentile—but when the parent asked the teacher what that meant in practical terms, the teacher simply could not respond because she didn't know what a percentile is.
- *Remember that in many cases it is sufficient to describe the test and students' performance in broad, general terms.* To illustrate, we might describe an achievement test as a general measure of how much a student has learned in science compared to what other students around the country have learned, or we might describe a scholastic aptitude test as something that provides a rough idea of how well a student is likely to do in a particular instructional program. It's sometimes possible to describe a student's performance without referring to specific test scores at all. For example, we might say, "Your daughter scores like students who do well in college math courses" or "Your son had more-than-average difficulty on the spelling subtest; this is an area in which he may need extra help in the next few years." However, if parents want to know their child's specific test scores, in the United States FERPA requires that we reveal them and help parents understand what they mean.
- *When reporting specific test scores, emphasize scores that are least likely to be misinterpreted.* Many parents mistakenly believe that a child's grade-equivalent score reflects the grade level the child should actually be in; consequently they may argue for advanced placement of high-achieving children or feel distressed that low-achieving children are in over their heads. And many parents interpret scores labeled as "IQs" as reflecting a permanent, unchangeable ability rather than a rough estimate of a child's present cognitive functioning. By reporting other kinds of scores—perhaps percentile scores, stanines, or NCEs—we're less likely to have parents jumping to such erroneous conclusions. Many parents are familiar with percentile scores, and many others can easily grasp the notion of a percentile if it's explained to them. But because percentile scores misrepresent actual differences among students (i.e., by overestimating actual ability differences in the middle range and underestimating differences at the

extremes), we may also want to provide stanine scores or NCEs. Although most parents are unfamiliar with standard scores in general, we can help them understand them using a concrete graphic, such as the one presented in Figure 15.10.

Also, when test results include confidence intervals, such as those depicted in the computer printouts is helpful to explain their general nature. By reporting confidence intervals along with specific test scores, we communicate an important point about classroom assessment: Any test score has some error associated with it.

Whenever we assess students’ achievement and abilities, we must remember that our primary purpose is to *help students learn and achieve more effectively*. When students perform well on classroom assessments and standardized tests, we have cause for celebration, because we know that our instructional strategies are working as they should. But when students perform poorly, our primary concern—and that of students, parents, school administrators, and policy makers as well—should be how to improve the situation.

Figure 15.10 A graphic for helping parents understand stanines and NCE scores.



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Chapter 15 What Have You Learned?

Not only are the RSVP characteristics important for individual assessments, but they’re also important—in fact, they’re even *more* important—for summaries of students’ general achievement and ability levels. Indicators of overall achievement should be reliable (reflecting a consistent pattern over time), standardized for all students (except in extenuating circumstances, such as when students have certain disabilities), valid (reflecting the actual achievement or abilities purportedly being measured), and practical (taking only a reasonable amount of time and effort). What’s ultimately *most* important is that assessment results are sufficiently accurate and dependable that they can effectively guide decision making in classrooms and schools.

With these points in mind, we now return to the chapter’s learning objectives and review some of the chapter’s key ideas.

15.1 Describe the nature, advantages, and disadvantages of three types of test scores: raw scores, criterion-referenced scores, and norm-referenced scores. Assessment scores take a number of forms, with different scores having distinctly different meanings. *Raw scores*, based on the number or percentage of items answered correctly or the number of points accumulated, have only limited utility unless they can be compared to a criterion for performance or to the performance of a norm group. *Criterion-referenced scores* tell us specifically what students know and can do. *Norm-referenced scores*—age and grade equivalents, percentile scores, and standard scores—enable us to compare our own students’ performance to the performance of others. Because age and grade equivalents are often misinterpreted and percentiles distort actual ability differences among students, standard scores are preferable whenever we need to compare students to their peers.

15.2 Identify important guidelines to follow in summarizing students’ achievement with final grades and portfolios. Most teachers eventually need to boil down the results of classroom assessments into general indicators of what students have learned. The most common procedure is to assign final grades that summarize what students have achieved over the course of the term or school year. Typically final grades should reflect actual achievement (rather than primarily reflecting effort or some other subjective quality) and be based on hard data.

One significant weakness of final grades is that they communicate very little about what a student specifically has learned and can do. An alternative to grades—a *portfolio*—provides a means for representing the multifaceted, complex nature of students’ accomplishments. When used to summarize students' achievement, portfolio contents should be closely tied to important instructional goals and standards, and students should have teacher guidance in choosing artifacts to include and organizing the final products.

15.3 Describe four different kinds of standardized tests, and explain how you might appropriately use and interpret these various tests. A wide variety of standardized tests are available for use in classrooms, including tests of achievement, general scholastic aptitude, specific aptitudes and abilities, and school readiness. As teachers, we must make sure that any standardized test we use meets the RSVP characteristics for our own situation and, if norm-referenced, has appropriate norms to which our students can be compared. Furthermore, we must take developmental factors into account when interpreting the results of standardized tests; for instance, young children's limited language skills and short attention spans make it more difficult to get valid assessments of their abilities, and some adolescents may be so cynical about the value of standardized tests that they put little thought or effort into their responses.

15.4 Explain how high-stakes testing and teacher accountability practices can affect instruction and classroom learning, and suggest several strategies for enhancing the benefits of these practices. Increasingly, standardized achievement tests are being used to make important decisions about students and to hold schools and individual teachers accountable for students' achievement levels. Many experts believe that such *high-stakes testing* and *accountability* create as many problems as they solve, but these practices are here to stay, at least for the short run. Thus, educators must become vocal advocates for reasonable, valid approaches to assessing students' overall progress and achievement and to evaluating teacher effectiveness, with an emphasis on enhancing instruction and learning rather than on punishing seemingly low-performing students, teachers, and schools.

15.5 Explain how you might accommodate group differences and special educational needs in your efforts to summarize students' achievement. Students' test scores and other assessment results can be affected by their ethnic- and cultural-group memberships, gender, and socioeconomic background in ways that impact the scores' reliability and validity. Furthermore, limited proficiency with the English language can interfere with some students' performance, as can cultural bias in the questions or tasks presented. Whenever we suspect that such factors may be affecting students' performance, we should interpret assessment results cautiously and look for other information that might either confirm or disconfirm those results. Furthermore, we should make reasonable accommodations for students' disabilities when administering tests to assess their achievement and abilities; such accommodations will increase the likelihood that the assessments yield useful information.

15.6 Distinguish between circumstances in which you should and should not reveal students' assessment results, and explain how you can effectively communicate these results to students and parents. For both legal and pedagogical reasons, we must keep students' assessment results confidential, communicating assessment scores and other information only to the students themselves, to their parents, and to school personnel directly involved in the students' education and well-being. We must also describe assessment results in ways that students and parents can understand—for instance, by using graphics that illustrate the nature of various norm-referenced scores—and we must remember that the ultimate purpose of any assessment is to *help students learn and achieve more effectively*.

Practice for Your Licensure Exam

Can Johnny Read?

Ms. Beaudry is serving on a committee to study reading curricula in her school district. As part of her work with the committee, she plans to administer a standardized reading achievement test to determine whether her sixth graders have mastered the reading skills she's been trying to teach them this year. She's been given the opportunity to select the test from three instruments approved for purchase in her district. She scrutinizes the test manuals carefully and eliminates one test when she sees that it has poor test–retest reliability. She looks closely at tables of specifications for the other two tests and eventually selects the Comprehensive Reading Test (CRT) as the most reliable and valid measure for her own class.

Ms. Beaudry gives the test to her class, following the prescribed administration procedures closely. Because the test consists entirely of multiple-choice items, she can score the results quickly and easily that night. She computes each student's raw score and then turns to the norms in the test manual to obtain stanine scores. Her students' stanines range from 3 to 8. "Hmmm, what now?" she asks herself. "After all of this, I still don't know if my students have learned what I've been trying to teach them."

1. **Constructed-response question:**

   Ms. Beaudry chooses the wrong test for her purpose. What specifically does she do wrong?

2. **Multiple-choice question:**

   Ms. Beaudry uses tables of specifications to determine the validity of two of the tests for her own situation. Which one of the following statements best describes a typical table of specifications?

   a. It describes the ideal curriculum for a particular content domain and grade level.
   b. It provides specific, item-by-item scoring criteria that enable objective, reliable scoring.
   c. It indicates the topics covered by an assessment and the things that students should be able to do related to each topic.
   d. It presents the average performance of students at various grade and age levels, thereby enabling conversion of a raw score to one or more norm-referenced scores.

PRAXIS Go to Appendix C, "Matching Book Content and Ebook Activities to the Praxis Principles of Learning and Teaching Tests," to discover sections of this chapter that may be especially applicable to the Praxis tests.

Appendix A

Describing Associations with Correlation Coefficients

- Do students with high self-esteem perform better in school than students with low self-esteem?
- As students move through the grade levels, do they become more intrinsically motivated to learn classroom subject matter or, instead, less intrinsically motivated to learn it?
- When students are given two different tests of general cognitive ability in the same week, how similar are their scores on the two tests likely to be?
- Are intellectually gifted students more emotionally well adjusted than their classmates of average intelligence?

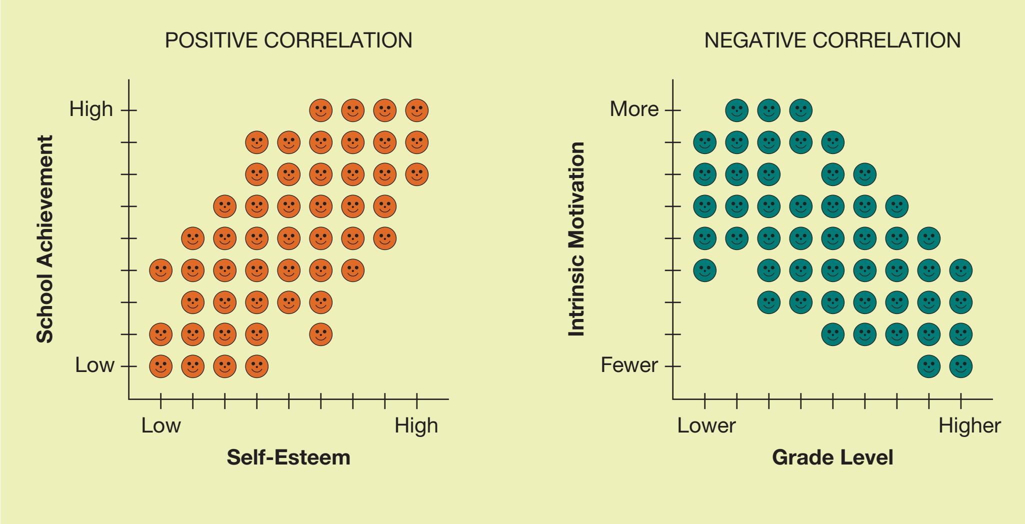
Each of these questions asks about an association between two variables—whether it be an association between self-esteem and school achievement, between grade level and intrinsic motivation, between two tests of general cognitive ability, or between giftedness and emotional adjustment. The nature of such associations is sometimes summarized by a statistic known as a **correlation coefficient**.

A correlation coefficient is a number between -1 and $+1$; most correlation coefficients are decimals (either positive or negative) somewhere between these two extremes. A correlation coefficient for two variables tells us about both the direction and the strength of the association between the variables.

Direction. The direction of the association is indicated by the *sign* of the coefficient—in other words, by whether the number is positive or negative. A positive number indicates a *positive correlation:* As one variable increases, the other variable also increases. For example, there's a positive correlation between self-esteem and school achievement: Students with higher self-esteem achieve at higher levels (e.g., Marsh et al., 2007). In contrast, a negative number indicates a *negative correlation:* As one variable increases, the other variable decreases instead. For example, there's a negative correlation between grade level and intrinsic motivation: On average, students in the upper grades (e.g., in junior high) have less intrinsic motivation to master classroom subject matter than younger students do (e.g., A. E. Gottfried et al., 2001). Figure A.1 graphically depicts the two correlations just described.

Strength. The strength of the association is indicated by the *size* of the coefficient. A number close to either $+1$ or -1 (e.g., $+.89$ or $-.76$) indicates a *strong* correlation: The two variables are closely related, so knowing the level of one variable allows us to predict the level of the other variable with considerable accuracy. For example, we often find a strong correlation between two tests of general cognitive ability given

Figure A.1 Each face in these two graphs represents one student in a group of 50 students. The location of the face tells the extent to which a student is high or low on the two characteristics indicated. There is a positive correlation between self-esteem and school achievement: Students with higher self-esteem tend to achieve at higher levels. There is a negative correlation between grade level and intrinsic motivation: Students in higher grades tend to have less intrinsic motivation to learn school subject matter than students in lower grades do.



within a short time period: Students tend to get similar scores on both tests, especially if the tests cover similar kinds of content (e.g., McGrew et al., 1997). In contrast, a number close to 0 (e.g., +.15 or −.22) indicates a *weak* correlation: Knowing the level of one variable allows us to predict the level of the other variable, but without much accuracy. For example, there's a weak association between intellectual giftedness and emotional adjustment: In general, students with higher measured intelligence levels (IQ scores) show better emotional well-being than students with lower scores (e.g., Janos & Robinson, 1985), but many students are exceptions to this general rule. Correlations in the middle range (e.g., those in the .40s and .50s, either positive or negative) indicate a *moderate* correlation.

As teachers, we will often encounter correlation coefficients in research articles in our professional books and journals. For instance, we might read that students' visual–spatial thinking ability is positively correlated with their success in a math class or that there's a negative correlation between class size and students' achievement test scores. Whenever we see such evidence of correlation, we must remember one very important point: *Correlation does not necessarily indicate causation.* For example, we can't say that visual–spatial thinking ability specifically *leads to* greater mathematical ability, nor can we say that a large class size specifically *interferes with* classroom achievement. Each of these italicized phrases implies a causal relationship that doesn't necessarily exist. Only carefully designed *experimental studies* enable us to draw conclusions about the extent to which one thing causes or influences another.

Chapter 1 discusses the nature of experimental studies.

Many computer programs (including Microsoft Excel) are programmed to compute correlation coefficients. You can also find websites that enable you to calculate correlations and other simple statistics (e.g., see easycalculation.com). Computing a correlation coefficient by hand is complicated but certainly possible. If you're interested in learning more, you can easily find the formula through an Internet search or in most introductory statistics textbooks.

Appendix B

Determining Reliability and Predictive Validity

If you've read Appendix A, you've already learned something about **correlation coefficients**—statistics that indicate the strength and direction of an association between two variables. A correlation coefficient is always a number between −1 and +1. A coefficient close to either +1 or −1 (e.g., +.89 or −.76) indicates a strong correlation, whereas a number close to 0 (e.g., +.15 or −.22) indicates a weak correlation. A *positive* coefficient (i.e., one preceded by either a plus sign or no sign at all) indicates a positive relationship: As one variable increases, the other variable also increases. A negative coefficient (i.e., one preceded by a minus sign) indicates a negative relationship: As one variable increases, the other variable *decreases.*

Psychologists sometimes use correlation coefficients to determine the reliability and predictive validity of an assessment instrument.

Determining Reliability

The “Fowl Play” exercise in Chapter 14 provides an example of poor test–retest reliability.

The **reliability** of a test or other assessment instrument is the extent to which it yields consistent information about the knowledge, skills, or other characteristic we're trying to assess. To mathematically calculate the reliability of an assessment instrument, we begin by getting two scores on the same instrument for the same group of students. We can get these two sets of scores in at least three different ways, with each approach giving us a somewhat different angle on the instrument's reliability. If we use the same instrument to assess students on two different occasions, we get information about **test–retest reliability**: the extent to which the instrument yields similar results over a short time interval. If we ask two or more people to judge students' performance—for instance, to grade the same set of essays or rate the same gymnastic performance—we get information about **scorer reliability**: the extent to which different people agree in their judgments of students' performance. If we compute two or more subscores for different items on the same instrument and look at how similar those subscores are, we get information about **internal consistency reliability**: the extent to which different parts of the instrument all assess the same characteristic.

Once we have two sets of scores for a single group of students, we can determine how similar the two sets are by computing a correlation coefficient; in this case, it's more frequently called a *reliability coefficient.* A reliability coefficient typically ranges from 0 to +1.[1] A number close to +1 indicates high reliability: The two sets of test scores are very similar. Although a perfect reliability coefficient of 1.00 is rare, many objectively scorable standardized achievement and ability tests have reliabilities of .90 or above, reflecting a high degree of consistency in the scores they yield. As reliability coefficients decrease, they indicate more error in the assessment results—error due to temporary, and in most cases irrelevant, factors. Publishers of standardized achievement and ability tests typically calculate and report reliability coefficients for the various scores and subscores the tests yield.

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[1] A negative coefficient is possible but would be obtained only when an *inverse* relationship between the two sets of scores exists—that is, when students who get the highest scores one time get the lowest scores the other time, and vice versa. Such an outcome is highly unlikely when calculating reliability.

Estimating Error in Assessment Results. A reliability coefficient tells us, in general, the degree to which temporary errors contribute to fluctuations in students' assessment results. But how much error is apt to be present in a *single* score? In other words, how close is a particular student's score to what it really should be? A number known as the **standard error of measurement (SEM)** allows us to estimate how close or far off the score might be. The standard error of measurement is calculated from the reliability coefficient; you can find details by searching for "calculating standard error of measurement" on the internet. If you conduct such a search, however, be careful *not* to click on sites that address standard error of the *mean,* which is a statistic used for an entirely different purpose.

Let's look at a concrete example. Imagine that Susan takes an academic achievement test known as the Basic Skills Test (BST). Imagine, too, that with her current level of reading ability, Susan should ideally get a score of 40 on the BST Reading subtest. Susan's ideal score of 40 is her **true score**: This is what she would theoretically get if we could measure her reading achievement *with complete accuracy.* But Susan misinterprets a few test items, answering them incorrectly when in fact she knows the correct answers, so she actually gets a score of only 37. Because we can't see inside Susan's head, we have no way of determining what her true score is; we know only that she has earned a 37 on the test. To estimate the amount of error in her score, we consult the BST test manual and learn that the standard error of measurement for the Reading subtest is, let's say, 5 points. We can then guess that Susan's true score probably lies somewhere within a range that's 1 SEM to either side of her test score: 37 ± 5, or between 32 and 42.[2]

Because almost any assessment score includes a certain amount of error, assessment results are sometimes reported not as specific scores, but as a range, or **confidence interval**. (The term *confidence band* is sometimes used instead, especially in computer-generated test reports for students and parents; alternatively, you may see the term *national percentile band* if percentile scores are being reported.) A confidence interval typically extends 1 SEM to either side of the actual test score. By reporting confidence intervals along with specific test scores, we communicate an important point about students' test results: Any test score has some error associated with it. Figure B.1 shows how we might report Susan's scores on the Reading and other subtests of the BST. Notice that the confidence intervals for the different subtests are different lengths, because each subtest has a different standard error of measurement.

When we use a single SEM to determine the confidence interval, there's a 68% chance that the student's true score falls within that interval. If we instead use *two* SEMs to determine the interval (for Susan's reading score, such an interval would be 27 to 47), we can be 95% confident that the true score lies within it.[3]

If two or more test scores come from the same test battery—and thus involve the same norm group—we can use the 68% confidence intervals for the scores to make meaningful comparisons. Overlapping confidence intervals for any two subtests indicate that the student has performed equally well in the two areas. But if the intervals show no overlap, we can reasonably conclude that the student has done appreciably better in

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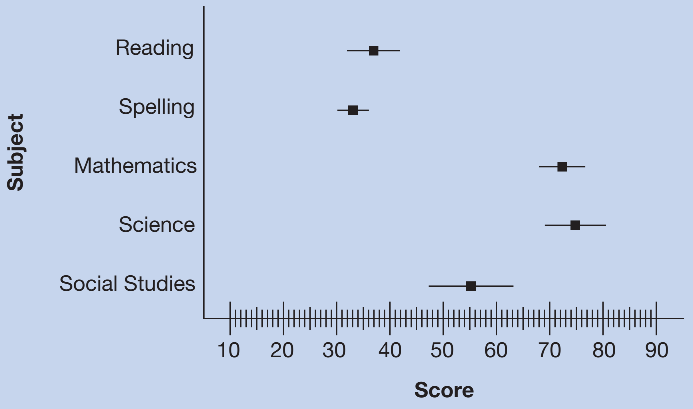
[2] Technically speaking, the simple add-and-subtract approach I describe here applies only to standard scores; it's a bit more complicated for other norm-referenced scores, such as percentiles and grade- and age-equivalents. But for most of my readers, details might be TMI—too much information—in an introductory discussion of assessment such as this one.

[3] If you have some knowledge of descriptive statistics, it may help you to know that, when standard scores are being reported, the SEM is the standard deviation for the hypothetical distribution of all possible scores that a student with a particular *true* score might get.

Figure B.1 A graphic representation of Susan's scores on the Basic Skills Test (BST).



This graph displays the following information about Susan's performance on the five subtests:

Subtest	*Score*	*SEM*	*Confidence Interval*
Reading	37	5	32–42
Spelling	33	3	30–36
Mathematics	72	4	68–76
Science	75	6	69–81
Social Studies	55	8	47–63

one area than the other. Using this approach with Susan's BST scores, we can conclude that Susan has performed best on the math and science subtests, less well on the social studies subtest, and least well on the reading and spelling subtests. We would *not* say that she has done better in science than in math or that she has done better in reading than in spelling, because the confidence intervals overlap for those two pairs of scores.

Determining Predictive Validity

The **predictive validity** of an assessment instrument (you may also see the term *criterion validity*) is the extent to which the instrument accurately predicts future performance in some domain. Publishers of standardized, norm-referenced ability tests often determine the accuracy with which test scores predict later success in certain content areas. To do so, they first give a test to a group of people; a few months or years later, they measure the same group's success or competence in the behavior being predicted (i.e., the criterion variable). They then calculate the correlation coefficient between the test scores and the criterion behavior. As is true for a reliability coefficient, this *validity coefficient* is typically a number between 0 and +1, with higher numbers indicating greater predictive validity. Tests with relatively high predictive validity for a particular behavior (e.g., validity coefficients in the .60s and .70s are usually considered high) predict that behavior fairly well. Those with lower predictive validity (e.g., coefficients in the .30s and .40s) yield less accurate predictions.

Any test's predictive validity can vary considerably depending on the specific criterion variable being predicted; for example, many scholastic aptitude tests more accurately predict academic performance in the near future (e.g., within the next 2 or 3 years) than in the distant future. Predictive validity also depends somewhat on the age-group in question; for instance, validity coefficients tend to be higher for students in the upper elementary and secondary grades than they are for young children. Typical validity coefficients for general scholastic aptitude tests (including intelligence tests) between .40 and .70. Those for specific aptitude tests often fall below .50.

Appendix C

Matching Text and Digital Content to the PRAXIS® *Principles of Learning and Teaching PreK-12 Test*

In the United States, state teacher licensing requirements in many states include passing Praxis tests published by Educational Testing Service (ETS). This text, *Educational Psychology: Developing Learners*, addresses most of the topics covered in the tests. The left column of Table C.1 presents the topics covered on the tests, as identified in *The Praxis Study Companion, Principles of Learning and Teaching: PreK-12* (Educational Testing Service, 2021). The test covers four broad domains: (1) Students as learners; (2) Instructional processes; (3) Assessment; and (4) Professional Development, Leadership, and Community. The middle column of the table indicates chapters and specific page nmbers in *Educational Psychology: Developing Learners* that are relevant to these topics. The right column correlates the PRAXIS topics with the relevant relevant digital materials available in this text.

*The Praxis Series*r™ Assessments[1] involve reading and analyzing some case studies, in addition to answering multiple choice questions. For this reason, the case studies and "Practice for Your Licensure Exam" exercises presented in *Educational Psychology: Developing Learners* may be especially helpful as you prepare for these tests. The opening case study in each chapter is addressed in several places throughout the chapter. The "Practice for Your Licensure Exam" exercise presents a second case study and poses questions that encourage you to apply the chapter content.

You may also want to obtain your own copy of *The Praxis Study Companion, Principles of Learning and Teaching: PreK-12*. It provides practice case studies and offers suggestions for analyzing them and responding to test questions. It is available through most online retailers.

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[1] *The Praxis Series, Professional Assessments for Beginning Teachers* is a registered trademark of Educational Testing Service (ETS). Praxis materials are reprinted by permission of ETS. Permission to reprint does not constitute review or endorsement by Educational Testing Service of this publication.

Table C.1 Matching Text and MyLab Education Content to the PRAXIS *Principles of Learning and Teaching* Tests

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	**Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)**	**Location of Topics and Practice Opportunities**
I. Students as Learners		
A. Student Development and the Learning Process		
► Understands the theoretical foundations of how students learn		
• Knows how knowledge is constructed	Chapter 7, 286–287	Video Example 3.3
• Knows a variety of means by which skills are acquired	pp. 77; 93; 179; 171; 182; 248; 328; 504; 533–534; 558; 364–366	
• Understand a variety of cognitive processes and how they are developed	Chapters 7 and 8	
► Knows the major contributions of foundational theorists to education, and relates the work of theorists to educational contexts		
• Bandura	Chapter 10	
• Bruner		
• Dewey		
• Piaget	Chapter 2	Video Examples 2.2, 2.3 Application Exercise 2.1
• Vygotsky	Chapter 2	Video Explanation 2.2 Application Exercise 2.3
• Kohlberg	Chapter 3	
• Bloom	p. 493	
► Understands the concepts and terms related to a variety of learning theories		
• Metacognition	pp. 281–292	Video Example 13.5 Application Exercise 8.1
• Schema	p. 249	
• Transfer	Chapter 8	Application Exercise 8.2
• Self-efficacy	pp. 8, 69, 369–70, 403–404	Video Examples 10.1 Video Explanation 10.2 Application Exercise 10.3
• Self-regulation	pp. 312–346	Video Examples 5.2, 8.1, 8.2, 8.3, 8.6
• Zone of proximal development	p. 43	Video explanation 2.3
• Classical and operant conditioning	Chapter 6	Video Example 6.1 Video Explanation 6.2, 6.4 Application Exercise 6.1
► Knows the distinguishing characteristics of the stages in each domain of human development (i.e., cognitive, physical, social, and moral)		Application Exercise 3.3
• Describes the characteristics of a typical child in each stage and each domain	Chapters 2 and 3	Video Example 3.3
• Recognizes typical and atypical variance within each stage and domain	Chapters 2 and 3	Video Example 2.1
► Understands how learning theory and human development impact the instructional process		
• Defines the relationship between learning theory and human development	Chapters 2 and 3; pp. 213, 255–6, ADD FOR CHAPTER 8	
• Provides examples of how learning theory is impacted by human development	Chapters 2 and 3; pp. 213, 255–6, ADD FOR CHAPTER 8	Video example 2.3
• Uses knowledge of learning theory to solve educational problems	Chapters 6–9	
• Uses knowledge of development to solve educational problems	Chapters 2 and 3	Video Example 2.3 Video Example 3.5cc

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	**Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)**	**Location of Topics and Practice Opportunities**
B. Students as Diverse Learners		
▶ Understands that a number of variables affect how individual students learn and perform		
• Identifies a number of variables that affect how students learn and perform		
• Culture	pp. 7, 22–23, 41–42, 76–77. 111–127, 111–112, 118–121, 340–344	Video Explanation 2.2 Application Exercises 2.2, 4.1, 9.2
• Socioeconomic status	pp. 136–141, 458, 434, 624	Application Exercises 4.3, 4.4
• Prior knowledge and experience	pp. 257–258, 261, 300, 511	Video Examples 2.4, 4.1 Application Exercises 2.1, 13.1
• Motivation	Chapters 10 and 11	Application Exercises 10.1, 11.1, 15.4 Video Examples 10.1, 10.2, 11.1 Video Explanations 10.1, 10.2, 10.3
• Self-confidence, self-esteem	pp. 68. 364, 369–377	Application Exercise. 3.2
• Cognitive development	Chapter 2	Video Example 3.3
• Maturity	Chapters 2 and 3	
• Language	pp. 50–57	Video Examples 2.5, 4.3 Application Exercises 2.2, 4.4
• Provides examples of how variables might affect how students learn and perform	p. 34	
▶ Recognizes areas of exceptionality and their potential impact on student learning		
• Identifies areas of exceptionality	Table 5.4	
• Cognitive	169–174, 182–184	
• Auditory	187–188	Video Example 2.5
• Visual	185–187	
• Motor/Physical	184–185	
• Speech/language	174–176	
• Behavioral	177–182	
• Explains a variety of ways exceptionalities may impact student learning	Chapter 5	
▶ Understands the implications and applications of legislation relating to students with exceptionalities on classroom practice		
• Identifies the provisions of legislation relevant to students with exceptionalities	164–167	Video Example 5.3
• Americans with Disabilities act (ADA)		
• Individuals with Disabilities Education Act (IDEA)	164	Video Example 5.3
• Section 504, Rehabilitation Act (504)	166–167	
• Explains how the provisions of legislation relating to students with exceptionalities affect classroom practice	164–168	
▶ Recognizes the traits, behaviors, and needs of intellectually gifted students	189–191	Video Examples 5.6, 5.7 Application Exercise 5.4
▶ Recognizes that the process of English language acquisition affects the educational experience of English learners (ELs)	53–57, 625–626	Video Example 2.5 Application Exercise 2.2
▶ Knows a variety of approaches for accommodating students with exceptionalities in each phase of the education process	Chapter 5	Video Example 3.4, 5.4 Video Explanations 5.1, 5.2, 6.5 Application Exercise 5.3
Recognizes students with exceptionalities require particular accommodations	169–194	Video Example 5.5 Video Explanation 5.1 Application Exercise 5.3

(*Continued*)

Table C.1 *(Continued)*

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	**Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)**	**Location of Topics and Practice Opportunities**
Knows how to modify instruction, assessment, and communication methods to meet a recognized need	169–194	Application Exercise 2.2 Video Example 3.4
C. Student Motivation and Learning Environment		
▶ Knows the major contributions of foundational behavioral theorists to education		
• Relates the work of behavioral theorists to educational contexts	Chapter 6	
• Thorndike		
• Watson		
• Maslow	368	
• Skinner	200–206	Video Explanations 6.1, 6.2
• Erikson	70–75	
▶ Understands the implications of foundational motivation theories for instruction, learning, and classroom management		Application Exercise 10.1 Video Example 11.1
• Defines terms related to foundational motivational theory	Chapters 10 and 11	
• Self-determination	389–397	Application Exercise 11.2 Video Explanation 10.3
• Attribution	408–412	Video Example 11.3 Video Explanation 11.1 Application Exercise 11.4
• Extrinsic/Intrinsic Motivation	360–362	Video Explanation 10.1 Application Exercise 11.1
• Cognitive dissonance	424–425, 487	
• Classic and operant conditioning	Chapter 6	Video Examples 6.1 Video Explanations 6.2, 6.4 Application Exercise 6.1
• Positive and negative reinforcement	205–230	Video Explanations 6.1, 6.2, 6.3 Video Examples 6.2 Application Exercise 6.2
• Relates motivation theory to instruction, learning, and classroom management	Chapters 11, 11, and 12	Video Examples 4.2, 11.1 Application Exercise 10.1
▶ Knows principles and strategies for classroom management		Application Exercise 3.1 Video Explanations 5.2, 12.5
• Knows how to develop classroom routines and procedures	Chapter 12	Video Explanation 12.4
• Knows how to maintain accurate records		
• Knows how to establish standards of conduct	448–450, 454–455	Video Example 12.3 Video Explanation 12.4
• Knows how to arrange classroom space	441–444	
• Recognizes ways of promoting a positive learning environment	444–446, 454–455	Video Examples 4.4, 12.2, 12.3 Video Explanations 5.2, 5.3, 9.2, 12.1 Application Exercises 6.3, 12.3
▶ Knows a variety of strategies for helping students develop self-motivation		Video Example 11.1
• Assigning valuable tasks	345–346. 382–387, 454–455	Video Exampled 4.2, 11.2
• Providing frequent positive feedback	211, 218, 500–501, 519, 554, 559	Video Example 6.3 Video Explanation 14.3
• Including students in instructional decisions	391–397, 455, 537, 609	
• De-emphasizing grades	Chapters 10 and 11	Application Exercise 15.4

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	**Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)**	**Location of Topics and Practice Opportunities**
II. Instructional Processes		
A. Planning Instruction		
▶ Understands the role of district, state, and national standards and frameworks in instructional planning		Video Explanation 14.5 Application Exercise 13.2
• Understands the theoretical basis of standards-based education	491–493	
• Knows resources for accessing district, state, and national standards and frameworks	492–493	
• Understands how standards and frameworks apply to instructional planning	491–493, 564	Video Explanation 14.5 Application Exercises 13.2, 15.3
▶ Knows how to apply the basic concepts of predominant educational theories		
• Understands the basic concepts of cognitivism	Chapter 7	
• Schema	249	
• Information processing	Chapter 7	Video Explanations 7.1, 7.2
• Mapping	502	
• Understands the basic processes of social learning theory	Chapter 10	
• Modeling	48, 364–369	Video Example 10.2
• Reciprocal determinism	364, 378–379	
• Vicarious learning	364–369	
• Understands the basic processes of constructivism	28, 235, 237–238	
• Learning as experience	Chapters 6, 7, 8	Video examples 2.4, 9.2
• Problem-based learning	304	Video Example 7.1
• Zone of proximal development	43	Video Explanation 2.3
• Scaffolding	47–48, 171, 184, 290–291, 490, 508, 518–519, 527–528	Video Example 8.4 Video explanation 2.4
• Inquiry/discovery learning	513–515	Video Examples 9.2, 13.6 Video Explanation 13.1
• Understands the basic concepts of behaviorism	Chapter 6	
• Punishment	206–226	Video Explanation 6.2
• Conditioning	201–207	Video Example 6.1
• Intrinsic and extrinsic rewards	210, 217, 220–221, 305, 362, 553	Video Explanation 10.1 Application Exercise 11.1
• Reinforcement	Chapter 6	Video Explanations 6.1, 6.2, 6.3, 6.4 Video Example 6.2 Application Exercise 6.2
• Knows how to apply the basic concepts of behaviorism, constructivism, social learning theory, and cognitivism to instructional contexts	Chapters 6–10	
▶ Understands how scope and sequence affect instructional planning		
• Defines and provides examples of scope	Chapter 13	
• Defines and provides examples of sequence	Chapter 13	
• Understands the relationship between scope and sequence and standards of learning	Chapter 13	
• Understands the role of scope of scope and sequence in curriculum planning	Chapter 13	Application Exercise 13.2

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Table C.1 *(Continued)*

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	**Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)**	**Location of Topics and Practice Opportunities**
► Knows how to select content to achieve lesson and unit objectives	491	
► Knows how to develop observable and measurable instructional objectives in the cognitive, affective, and psychomotor domains	493–494, 505, 556	
• Distinguishes among the different learning domains	Chapter 13	
• Knows how to apply Bloom's taxonomy to the development of learning objectives	493	
• Knows how to describe observable behavior	548–551	Application Exercise 1.3
• Knows how to describe measurable outcomes	Chapter 14 and 15	
► Is aware of the need for and is able to identify various resources for planning enrichment and remediation		
• Identifies when remediation is appropriate	Chapter 5	
• Identifies when enrichment is appropriate	189–191	Video Examples 5.6, 5.7 Application Exercise 5.4
• Identifies a variety of resources for locating, adapting, or creating enrichment and remediation activities	189–191, Chapter 13	
► Understands the role of resources and materials in supporting student learning		
• Identifies and explains the uses of a variety of resources and materials that support student learning	Chapter 13	
• Computers, the Internet and other digital resources	348–350, 493, 522–523	Video Examples 5.1, 13.4 Video Explanation 9.3, 11.2 Application Exercise 9.3
• Library collection (books, magazines, pamphlets, reference works)		
• Artifacts, models, manipulatives	354, 496, 533	
• Guest speakers and community members	97	
► Knows how to develop lessons as part of thematic and/or interdisciplinary units		
• Understands the basic concepts of thematic instruction	268, 523	
• Understands the components of thematic units		
• Selecting a theme		
• Designing integrated learning activities		
• Selecting resources		
• Designing Assessments	Chapter 14	268, 523
• Understands the basic concepts of interdisciplinary instruction	268, 523	
• Understands the components of interdisciplinary units	268, 523	
• Collaborating		
• Generating applicable topics		
• Developing an integrative framework		
• Planning instruction for each discipline	523–537	
• Designing integrative assessment		

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	**Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)**	**Location of Topics and Practice Opportunities**
▶ Recognizes their role in collaborating with instructional partners in instructional planning		
• Identifies a variety of instructional planning partners		
• Special education teachers	Chapter 5	
• School librarian		
• Teachers of the gifted and talented	190–191	Video Exampled 5.6, 5.7 Application Exercise 5.4
• IEP team members	590	Video Example 5.3
• Paraeducators		
• Describes the roles each partner plays in collaborative activities		
B. Instructional Strategies		
▶ Understands the cognitive processes associated with learning		
• Critical thinking	167, 307–311	Application Exercise 8.4
• Creative thinking	298–398	Application Exercise 8.3
• Questioning	252, 286, 320, 513	Video Example 13.1 Video Explanation 14.3
• Inductive and deductive reasoning	614 (deductive)	
• Problem solving	36, 298–308, 321–324, 326–328, 528	Video Examples 7.1, 8.5
• Planning	Chapter 13, 451–453, 565, 581	
▶ Understands the distinguishing features of different instructional models		
• Direct	505–506	Video Example 3.4
• Indirect		
• Independent	191, 392–393, 505	
• Experiential	191, 297, 345–347	
• Interactive	Chapter 13	
▶ Knows a variety of instructional strategies associated with each instructional model		
• Identifies instructional strategies associated with direct instruction	505–506	
• Explicit teaching	505–506, 531	
• Drill and practice	14, 217, 260, 270, 490, 538	
• Lecture	541, 542	
• Demonstrations	256, 266, 368, 532	
• Guides for reading, listening, and viewing		
• Identifies instructional strategies associated with indirect instruction		
• Problem solving	36, 298–308, 321–324, 326–328, 528	Video Examples 7.1, 8.5
• Inquiry		Video Explanation 13.1
• Case studies		
• Concept mapping	254, 349	
• Reading for meaning	285, 513, 524–548	
• Cloze procedures		
• Identifies instructional strategies associated with independent instruction	Chapter 13	
• Learning contracts	218	
• Research projects	15, 348	
• Learning centers		Application Exercise 9.1

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Table C.1 *(Continued)*

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	**Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)**	**Location of Topics and Practice Opportunities**
• Computer mediated instruction	290–291	Application Exercise 9.3 Video Explanation 11.2
• Distance learning	323–324, 352–353	
• Identifies instructional strategies associated with experiential and virtual instruction	323–324, 352–353	
• Field trips	140, 337	
• Experiments	34, 530, 534	Video Example 13.6
• Simulations	297	
• Role play	537	
• Games	101, 135	
• Observations	48, 364–369	
• Identifies instructional strategies associated with interactive instruction		
• Brainstorming	502–503	
• Cooperative learning groups	516–519	Video Examples 4.2, 13.3 Video Explanation 12.5
• Interviews	9, 580	
• Discussions	512	
• Peer practice	252, 519–522	Video Example 13.4
• Debates	345	
Knows a variety of strategies for encouraging complex cognitive processes	281–291	Application Exercise 2.1
Identifies complex cognitive processes	Chapter 8	
Concept learning	250, 259	
• Problem solving	36, 298–308, 321–324, 326–328, 528	Video Example 8.5
• Metacognition	281–292	Video Example 13.5 Application Exercise 8.1
• Critical thinking	167, 307–311	Application Exercise 7.2
Transfer	292–298, Chapter 8	Application Exercise 8.2
▶ Knows instructional activities specific to the development of complex cognitive processes	281–291	Application Exercise 2.1
• Distinguishing fact from opinion	287–288	
• Comparing and contrasting	284	
• Detecting bias	309, 311	
• Predicting	322, 513	Video Example 8.1
• Categorizing	248, 530	
• Analyzing	162, 266, 493	Video Example 14.2
• Sequencing	393	
• Summarizing	284	Video Example 8.3
• Inferring	309	
• Decision making	306, 324	
• Evaluating	40, 69, 70, 96, 162	
• Synthesizing	284, 253	
• Generalizing	72, 183	
▶ Knows a variety of strategies for supporting student learning		Application Exercise 8.1
• Modeling	48, 364–369	Video Example 10.2

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	**Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)**	**Location of Topics and Practice Opportunities**
• Developing self-regulation skills	312–326, 471–472, 504	Video Examples 8.1, 8.2, 8.3, 8.6
• Scaffolding	47–48, 171, 184, 290–291, 490, 508, 518–519, 527–528	Video Explanation 2.4 Video Example 8.4
• Differentiating instruction	149, 490	
• Guided practice	354, 395, 505	
• Coaching	48, 403	
		Video Examples 8.1, 8.2, 8.3, 8.6
▶ Knows basic strategies for promoting and supporting students' development of self-regulatory skills		Video Examples 8.1, 8.2, 8.3, 8.6 Application Exercise 8.1
• Setting goals	316, 445, 526	Video Example 15.4
• Managing time	174	
• Organizing information	248–251, 253	
• Monitoring progress	285, 317–318, 320, 558	
• Reflecting on outcomes	314	
• Establishing a productive work environment	Chapter 12	Video Example 12.2 Video Explanations 12.1, 12.2 Application Exercise 5.2
▶ Understands the design of different group configurations for learning		
• Pair/share		
• Whole-class	Chapter 13	
• Small-group	Chapter 13	Video Examples 3.1, 12.1 Application Exercise 14.4
• Independent learning	191, 392–393, 505	
• One-on-one	191, 392–393, 505	
▶ Understands the uses, strengths, limitations, and implications of different grouping techniques and strategies		Video Example 3.1
• Cooperative learning	516–519, 522	Video Examples 4.2, 13.3 Video Explanation 12.5
• Collaborative learning	522–523, 87	Video Example 13.4 Video Explanation 12.5
• Heterogeneous grouping	517	
• Homogeneous grouping	125, 407, 428	
• Multi-age grouping		
▶ Knows how to select an appropriate strategy for achieving an instructional objective	Chapter 13	Video Example 4.2
▶ Explains the instructional purposes and knows strategies for monitoring and adjusting instruction in response to student feedback	Chapter 13	Video Explanation 14.3
▶ Recognizes the purpose of reflecting upon, analysing and evaluating the effectiveness of instructional strategies	Chapter 13	Application Exercises 2.1, 12.3, 13.3
▶ Knows the characteristics of different types of memory and their implications for instructional planning and student learning	Chapter 7	Video Explanation 7.1 Application Exercise 7.1
• Short-term memory	242–244	
• Long-term memory	247–261	Video Explanation 7.1 Application Exercises 7.2, 7.3
▶ Recognizes the roles and uses of "teachable moments" in instruction		

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Table C.1 *(Continued)*

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	**Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)**	**Location of Topics and Practice Opportunities**
C. Questioning and Communication Techniques		
▶ Knows the components of effective questioning		Application Exercise 11.4 Video Example 13.1 Video Explanation 14.3
• Allowing think/wait time	271, 274	
• Helping students articulate their ideas	252–253, 501	
• Respecting student answers	126	Video Explanation 12.1
• Handling incorrect answers	508, 518	
• Encouraging participation	144, 344	Video Example 15.1
• Establishing a non-critical classroom environment		
• Promoting active listening	51, 494, 513,	
• Varying the types of questions	116–17, 286, 305, 362–363, 500–501, 569, 576	
▶ Understands and can explain and provide examples of different purposes of questioning		Application Exercise 11.4 Video Example 13.1 Video Explanation 14.3
• Developing interest and motivating students	385–387	Video Examples 3.6, 11.2 Application Exercises 10.1, 11.1, 11.2
• Evaluating students' preparation	Chapter 14	
• Reviewing previous lessons	269–270	
• Helping students set realistic expectations	315–16, 407, 411, 420, 460, 445, 526	
• Engaging students in discussion	512	Video Examples 3.6, 15.1 Video Explanation 14.3
• Determining prior knowledge	150, 257–258, 261, 300, 511	
• Preparing students for what is to be learned	451, 453, 499, 505, 540,	
• Guiding thinking	184, 336, 337, 347	
• Developing critical and creative thinking skills	298–312, 316. 445, 526	Application Exercises 8.3, 8.4
• Checking for comprehension or level of understanding	490, 548–550	
• Summarizing information	513	Video Example 8.3
• Stimulating students to pursue knowledge on their own	385–387	
▶ Knows strategies for supporting students in articulating their ideas		Video Example 13.1
• Verbal and non-verbal prompting	Chapter 13	
• Restatement		
• Reflective listening statements	513	
• Wait time	117, 271, 274	
▶ Knows methods for encouraging higher levels of thinking; can guide students to:		Video Example 13.1
• Reflect	7, 314, 523, 609	
• Challenge assumptions	119–120, 126	
• Find relationships	Chapter 8	
• Determine relevancy and validity of information	119–20, 126	
• Design alternate solutions	298–307	
• Draw conclusions		
• Transfer Knowledge	292–298, Chapter 8	Application Exercise 8.2

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	**Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)**	**Location of Topics and Practice Opportunities**
▶ Knows strategies for promoting a safe and open forum for discussion		Video Explanations 12.1, 12.2
• Engaging all learners	Chapters 10 and 11	Application Exercises 3.1, 10.3 Video Explanation 11.2
• Creating a collaborative environment	87, 120–127, 522–3	Video Examples 3.4 Video Explanation 12.1
• Respecting diverse opinions	95, 120–127, 282, 311	Video Explanation 12.1
• Supporting risk-taking	Chapters 10 and 11	
▶ Understands various verbal and nonverbal communication modes		
• Body language	130, 436	
• Gesture	176, 210	
• Tone, stress, and inflection	188	Application Exercise 5.1 Video Example 13.2
• Eye contact	436	
• Facial expression	436	
• Personal space	116	
▶ Is aware of how culture and gender can affect communication	Chapter 4	Video Examples 4.1, 4.2 Application Exercises 4.1, 9.2
▶ Knows how to use various communication tools to enrich the learning environment	90–91, 129, 189, 220, 260–61, 324, 348–350, 442, 498	
• Audio and visual aids		
• Text and digital resources	348–350m	
• Internet and other computer-based tools	137, 260–61, 290–291, 348–350, 507–8, 522–23	Video Example 13.4 Video Explanation 9.3, 11.2
▶ Understands effective listening strategies		
• Attending to the speaker		
• Restating key points	513	
• Asking questions	243, 252, 380, 421, 518–520, 576, 580,	Video Example 3.6 Application Exercise 11.4
• Interpreting information	93	
• Providing supportive feedback	211, 218, 500–501, 519, 554, 559	Video Example 6.3 Video Explanation 14.3 Application Exercises 11.4, 14.2
• Being respectful	Chapter 12	Video Explanation 12.1
III. Assessment		
A. Assessment and Evaluation Strategies		
1. Understands the role of formal and informal assessment in informing the instructional process	549–550	
a. Defines and provides uses and examples of formal and informal assessment modes	549–550	
b. Explains a variety of ways the results of formal and informal assessment are used to make educational decisions	549–551	
2. Understands the distinctions among the different types of assessment	Chapters 14 and 15	
a. Defines and provides uses and examples of formative, summative, and diagnostic assessment	548–549, 552	Video Example 11.3 Video Explanations 14.1, 14.2, 14.3, 14.4

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Table C.1 *(Continued)*

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)	Location of Topics and Practice Opportunities
3. Knows how to create and select an appropriate assessment format to meet instructional objectives	Chapters 14 and 15	Video Explanation 14.1
a. Knows how to create assessments in a variety of formats	Chapters 14 and 15	
b. Is able to select an assessment format to meet a specific instructional objective	Chapters 14 and 15	Video Explanation 14.1
4. Knows how to select from a variety of assessment tools to evaluate students' performance	Chapters 14 and 15	
a. Knows a variety of assessment tools, their uses, strengths and limitations	Chapters 14 and 15	
• Rubrics	554, 556, 557, 577, 582, 584	Video Explanations 10.1, 14.2
• Analytical checklists	554, 556, 562, 575, 582, 584	Application Exercise 14.4 Video Explanation 14.2
• Scoring guides	556, 558, 582–583	
• Anecdotal notes		
• Continuums	550	
b. Is able to select an assessment tool appropriate for quantifying the results of a specific assessment	Chapters 14 and 15	
5. Understands the rationale behind and the uses of students' self and peer assessment	286, 559, 609	Video Examples 8.7, 14.1
a. Defines and provides uses and examples of student self-assessment modes	286, 318–319x	Video Example 14.1
b. Defines and provides uses and examples of peer assessment modes	286	Video Example 8.7
c. Explains the strengths and limitations of self and peer assessment modes	Chapters 14 and 15	
6. Knows how to use a variety of assessment formats	Chapters 14 and 15	
a. Describes and provides uses, strengths, and limitations of a variety of assessment formats		
• Essay	509	Application Exercise 12.1
• Selected response		
• Portfolio	603–612	Video Examples 15.2, 15.3, 15.4
• Conference	558, 607, 610, 630	Video Examples 15.3, 15.4 Application Exercise 14.2
• Observation	568–570	Application Exercise 1.3
• Performance	579–584	
b. Is able to select an assessment format appropriate to a specific educational context		Application Exercise 14.1
B. Assessment Tools		
1. Understands the types and purposes of standardized tests	Chapter 15	Application Exercises 14.3, 15.3
a. Explains the uses of the different types of standardized test • Achievement		
• Aptitude	613–614	
• Ability	614	
b. Recognizes the data provided by the different types of standardized tests	618–619	Application Exercise 15.3

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	**Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)**	**Location of Topics and Practice Opportunities**
2. Understands the distinction between norm-referenced and criterion-referenced scoring	596–603	Application Exercise 15.1
a. Explains the uses of norm-referenced and criterion-referenced tests	596–603	Application Exercise 15.1
b. Explains data provided by a norm-referenced and a criterion-referenced test	596–603	Application Exercise 15.1
3. Understands terminology related to testing and scoring		
a. Defines and explains terms related to testing and scoring	Chapters 14 and 15	
• Validity	562–567	Application Exercise 14.3
• Reliability	560–562	Application Exercise 14.3
• Raw score	596–597	
• Scaled score		
• Percentile	618–619	
• Standard deviation	600–602	
• Mean, Mode and Median	600	
• Grade-equivalent scores	598	
• Age-equivalent scores	598	
4. Understands the distinction between holistic and analytical scoring	582, 611	Video Example 5.2
a. Describes holistic scoring and analytical scoring	582, 611	
b. Identifies an educational context for each	582, 611	
5. Knows how to interpret assessment results and communicate the meaning of those results to students, parents/caregiver, and school personnel	Chapters 14 and 15	Application Exercise 15.4
a. Understands what scores and testing data indicate about a student's ability, aptitude, or performance	613–614	Video Explanation 14.5
b. Is able to explain results of assessments using language appropriate for the audience	Chapters 14 and 15	Application Exercise 15.4
IV. Professional Development, Leadership, and Community		
A. Professional Development		
1. Is aware of a variety of professional development practices and resources		
a. Profession literature		
b. Professional associations		
c. Workshops		
d. Conferences		
e. Learning communities		
f. Graduate courses		
g. Independent research	Chapter 1	
h. Internships		
i. Mentors		
j. Study groups		
2. Understands the implications of research, views, ideas and debates on teaching practices	Chapter 1	Application Exercise 1.1
a. Knows resources for accessing research, views, ideas and debates on teaching practices	Chapter 1	

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Table C.1 *(Continued)*

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	**Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)**	**Location of Topics and Practice Opportunities**
b. Interprets data, results, and conclusions from research on teaching practices	Chapter 1	Application Exercise 1.1
c. Is able to relate data, results, and conclusions from research and/or views, ideas and debates to a variety of educational situations	Chapter 1	Application Exercises 1.1, 1.2
3. Recognizes the role of reflective practice for professional growth		Application Exercises 1.2, 12.3
a. Defines the purposes of reflective practice		
• Knows a variety of activities that support reflective practice		
• Reflective Journal		
• Self and peer assessment		Video Example 8.7
• Incident analysis		
• Portfolio		Video Examples 15.2, 15.3, 15.4
• Peer observation		
• Critical friend		
B. Leadership and Community		
1. Is aware of school support personnel who assist students, teachers, and families	Chapter 5	
a. Guidance counselors	161, 398	
b. IEP team members	165	Video Example 5.3
c. Special education teachers	Chapter 5	
d. Speech, physical and occupational therapists	Chapter 5	
e. School Librarians		
f. Teachers of the gifted and talented	Chapter 5	Video Examples 5.6, 5.7 Application Exercise 5.4
g. Paraeducators		
2. Understands the role of teachers and schools as educational leaders in the greater community		
a. Role of teachers in shaping and advocating for the profession		
b. Perceptions of teachers		
c. Partnerships with parents and family members	181, 194, 256, 385, 425, 498, 504	Video Explanation 14.5 Application Exercise 4.4
d. Partnerships with the community		
3. Knows basic strategies for developing collaborative relationships with colleagues, administrators, other school personnel, parents/caregivers, and the community to support the educational process	Chapter 1	Video Explanation 14.5 Application Exercises 4.4, 12.2, 15.3
a. Knows the elements of successful collaboration		
• Developing an action plan		
• Identifying the stakeholders		
• Identifying the purpose of the collaboration		
• Supporting effective communication		
• Seeking support		

Topics in the *PRAXIS Principles of Learning and Teaching: PreK-12 Exam*	Location of Topics in Anderman/Anderman/Ormrod, *Educational Psychology: Developing Learners* (11th ed.)	Location of Topics and Practice Opportunities
4. Understands the implications of major legislation and court decisions relating to students and teachers a. Equal access b. Privacy and confidentiality c. First Amendment issues d. Intellectual freedom e. Mandated reporting of child neglect/abuse f. Due process g. Liability h. Licensing and tenure i. Copyright	Chapter 5	

Glossary

accommodation. Process of responding to or thinking about a new object or event by either modifying an existing scheme or forming a new one.

acculturation. Gradual process of adopting the values and customs of a new culture.

action research. Research conducted by teachers and other school personnel to address issues and problems in their own schools or classrooms.

activation. Degree to which something in memory is being actively attended to and mentally processed.

actual developmental level. Upper limit of tasks that a learner can successfully perform independently.

adaptive behavior. Behavior related to daily living skills or appropriate conduct in social situations; used as a criterion for identifying students with intellectual disabilities.

adaptive testing. Computer-based assessment in which students' performance on early items determines which items are presented subsequently.

advance organizer. Introduction to a lesson that provides an overall organizational scheme for the lesson.

affect. Feelings, emotions, and moods that a learner brings to bear on a task.

African American English. Dialect of some African American communities that includes some pronunciations, idioms, and grammatical constructions different from those of Standard English.

age-equivalent score. Test score that matches a particular student's performance with the average performance of students of a certain age.

agentic engagement. Characterized by students taking the initiative to openly express their opinions about what they are learning, and readily engage in conversations about academic content.

aggression. Action intentionally taken to hurt another either physically or psychologically.

algorithm. Prescribed sequence of steps that guarantees a correct problem solution.

analytic scoring. Scoring a student's performance on an assessment by evaluating various aspects of it separately.

antecedent response. Response that influences the probability that a certain *other* response will follow.

antecedent stimulus. Stimulus that influences the probability that a particular response will follow.

anxiety. Feeling of uneasiness and apprehension concerning a situation with an uncertain outcome.

applied behavior analysis (ABA). Systematic application of behaviorist principles in educational and therapeutic settings.

apprenticeship. Mentorship in which a novice works with an expert for a lengthy time period to learn how to accomplish increasingly complex tasks within a particular domain.

appropriation. Process of internalizing but also adapting the cognitive tools of one's culture for one's own use.

argument analysis. Close inspection and evaluation of reasons (*arguments*) that do and do not support a particular conclusion; is a form of critical thinking.

assessment. Process of observing a sample of a student's behavior and drawing inferences about the student's knowledge and abilities.

assessment bias. Factor in an assessment instrument or procedure that consistently and differentially influences students' performance for reasons unrelated to the characteristic being measured; reduces the validity of assessment results.

assimilation. Process of responding to or thinking about an object or event in a way that is consistent with an existing scheme.

assistive technology. Any electronic or nonelectronic device that can enhance certain abilities or performance areas for students with disabilities.

astrocyte. Star-shaped brain cell hypothesized to be involved in learning and memory; has chemically mediated connections with many other astrocytes and with neurons.

asynchronous collaboration. Online collaborative activities in which individuals interact with others (e.g., via discussion boards) at times that are convenient for each individual.

asynchronous online learning. Format of online learning in which the teacher and the students do not interact with each other in real time; often the teacher will record video or audio lectures that students can review whenever they choose to.

attachment. Strong, affectionate bond formed between a child and a caregiver.

attention. Focusing of mental processing on particular stimuli.

attention-deficit hyperactivity disorder (ADHD). Disorder marked by inattention, hyperactivity, impulsive behavior, or some combination of these characteristics.

attribution. Self-constructed causal explanation for a personally experienced or observed event, such as one's own or another person's success or failure.

authentic activity. Classroom activity similar to an activity that students are apt to encounter in the outside world.

authentic assessment. Assessment of students' knowledge and skills in a manner similar to one that might be found in the outside world.

authoritarian parenting. Parenting style characterized by rigid rules and expectations for behavior that children are asked to obey without question.

authoritative parenting. Parenting style characterized by emotional warmth, high standards for behavior, explanation and consistent enforcement of rules, and inclusion of children in decision making.

autism spectrum disorders. Disorders marked by impaired social cognition, social skills, and social interaction, presumably due to a brain abnormality; extreme forms often associated with significant cognitive and linguistic delays and highly unusual behaviors.

automaticity. Ability to respond quickly and efficiently while mentally processing or physically performing a task.

backward design. Approach to instructional planning in which a teacher first determines the desired end result (i.e., what knowledge and skills students should acquire), then identifies appropriate assessments, and finally determines appropriate instructional strategies.

baseline. Frequency of a response before it is intentionally and systematically reinforced.

basic interpersonal communication skills (BICS). Proficiency in English sufficient for day-to-day conversation with English speakers but *not* sufficient for academic success in an English-only curriculum.

behavioral control. The extent to which parents exert control over their children through the use of implementation of rules and communication about expectations.

behavioral momentum. Increased tendency for a learner to make a particular response immediately after making similar responses.

behaviorism. Theoretical perspective in which learning and behavior are described and explained in terms of stimulus–response relationships.

belonging. Feeling that one is an important and valued member of a group.

belongingness. General sense that one is an important and valued member of the classroom or school.

between-group differences. Specific ways in which members of one group are different *on average* from those of another group.

bilingual education. Second-language instruction in which students are instructed in academic subject areas in their native language while simultaneously being taught to speak and write in the second language.

bioecological systems theory. Theory proposing that a child's everyday environments and the child's broader social and cultural contexts interact in their influences on the child's development.

Bloom's taxonomy. Taxonomy of six cognitive processes, varying in complexity, that lessons might be designed to foster.

boredom. Unpleasant affective state that results from lack of stimulation and arousal.

bully. Person who frequently threatens, harasses, or causes injury to particular peers.

central executive. Component of human memory that oversees the flow of information throughout the memory system.

challenge. Situation in which a learner believes that success is possible with sufficient effort.

checklist. List of characteristics that good performance on an assessment task should have.

child maltreatment. Consistent neglect or abuse of a child that jeopardizes the child's physical and psychological well-being.

class inclusion. Recognition that an object simultaneously belongs to a particular category and to one of its subcategories.

classical conditioning. Form of learning in which a new, involuntary response is acquired as a result of two stimuli being presented close together in time.

classroom climate. Overall psychological atmosphere of the classroom.

classroom management. Establishment and maintenance of a classroom environment that's conducive to learning and achievement.

clinical method. Procedure in which an adult presents a task or problem and asks a child a series of questions about it, tailoring later questions to the child's previous responses.

clique. Moderately stable friendship group of perhaps 3 to 10 members.

co-regulated learning. Process through which an adult and child share responsibility for directing various aspects of the child's learning; alternatively, collaborative process in which one or more learners jointly support and monitor one another's learning progress.

code-switching. Deliberately switching from using one language to using another language.

cognitive academic language proficiency (CALP). Mastery of English vocabulary and syntax sufficient for English language learners to achieve academic success in an English-only curriculum.

cognitive apprenticeship. Mentorship in which an expert and novice work together on challenging tasks, with the expert providing guidance regarding how to *think* about the tasks.

cognitive behavioral therapy. Planned, systematic combination of behaviorist techniques and cognition-based strategies (e.g., modeling, self-regulation techniques) as a means of bringing about desired behaviors.

cognitive development. Development of increasingly sophisticated thinking, reasoning, and language with age.

cognitive dissonance. Feeling of mental discomfort caused by new information that conflicts with current knowledge or beliefs.

cognitive load. Cognitive burden that a particular learning activity places on working memory at any one time; includes both the amount of information learners must simultaneously think about and the specific cognitive processes learners must engage in to understand what they're studying.

cognitive modeling. Demonstrating how to think about as well as how to do a task.

cognitive neuroscience. Study of how various brain structures and functions are related to human learning and behavior; also known as *neuropsychology*.

cognitive process. Particular way of thinking about and mentally responding to a certain event or piece of information.

cognitive psychology. General theoretical perspective that focuses on the mental processes underlying learning and behavior; encompasses information processing theory, individual constructivism, and related perspectives.

cognitive style. Characteristic way in which a learner tends to think about a task and process new information; typically comes into play automatically rather than by choice.

cognitive tool. Concept, symbol, strategy, procedure, or other culturally constructed mechanism that helps people think about and respond to situations more effectively.

collaborative social reasoning. An instructional strategy in which students are arranged in small groups and discuss social issues in an open, mutually respectful manner. Students are encouraged to consider each others' perspectives, and then to collaboratively come up with a group-generated recommendation.

collective self-efficacy. People's beliefs about their ability to be successful when they work together on a task.

community of learners. Class in which teachers and students actively and collaboratively work to create a body of knowledge and help one another learn.

community of practice. Group of people who share common interests and goals and regularly interact and coordinate their efforts in pursuit of those interests and goals.

complex cognitive process. Cognitive process that involves going well beyond the information specifically learned; for example, it might involve analyzing, applying, or evaluating the information.

comprehension monitoring. Process of checking oneself to verify understanding and memory of newly acquired information.

computer-based instruction (CBI). Academic instruction provided by means of specially designed computer software and/or Internet websites.

concept. Mental grouping of objects or events that have something in common.

concept map. Diagram of concepts and their interrelationships; can enhance learning and memory of a topic.

conceptual change. Significant revision of one's existing beliefs about a topic, enabling new, discrepant information to be better understood and explained.

conceptual understanding. Meaningfully learned and well-integrated knowledge about a topic, including many logical connections among specific concepts and ideas.

concrete operations stage. Piaget's third stage of cognitive development, in which adult-like logic appears but is largely limited to concrete objects and events.

conditional knowledge. Knowledge concerning appropriate ways to respond (physically or mentally) under various circumstances.

conditioned response (CR). Response that begins to be elicited by a particular (conditioned) stimulus through classical conditioning.

conditioned stimulus (CS). Stimulus that, through classical conditioning, begins to elicit a particular response as a result of being experienced in conjunction with another (unconditioned) stimulus.

conditioning. Term commonly used by behaviorists for *learning;* typically involves specific environmental events leading to the acquisition of specific responses.

confidence interval. Range around an assessment score reflecting the amount of error that might have influenced the student's performance on this particular occasion (reflecting imperfect reliability of the assessment instrument).

confirmation bias. Tendency to seek information that confirms rather than discredits one's current beliefs.

conservation. Recognition that if nothing is added or taken away, the amount stays the same, regardless of alterations in shape or arrangement.

consolidation. Neurological process in which newly acquired knowledge is firmed up in the brain; often takes several hours, sometimes even longer.

construct validity. Extent to which an assessment accurately measures an unobservable educational or psychological characteristic.

constructed-response task. Recall assessment task that requires a lengthy response; often also requires elaboration, analysis, synthesis, and/or application of learned information.

construction. Mental process in which a learner takes many separate pieces of information and uses them to build an overall understanding or interpretation.

constructivism. Theoretical perspective proposing that learners actively construct (rather than passively absorb) knowledge and beliefs from their experiences.

content-area standards. General statements regarding the knowledge and skills that students should gain and the characteristics that their accomplishments should reflect in a particular academic discipline.

content validity. Extent to which an assessment includes a representative sample of tasks within the content domain being assessed.

contextual theory. Theoretical perspective that focuses on how people's general physical, social, and/or cultural surroundings support their learning, development, and behavior.

contiguity. Occurrence of two or more events (e.g., two stimuli, or a stimulus and a response) at approximately the same time.

contingency. Situation in which one event happens only after another event has already occurred; one event is *contingent* on the other's occurrence.

contingency contract. Formal agreement between a teacher and a student that identifies behaviors the student will exhibit and the reinforcers that will follow.

continuous reinforcement. Reinforcement of a response every time it occurs.

control group. Group of people in a research study who are given either no intervention or a *placebo* treatment that is unlikely to have an effect on the dependent variable.

controversial student. Student whom some peers strongly like and other peers strongly dislike.

conventional morality. Uncritical acceptance of society's conventions regarding right and wrong behaviors.

conventional transgression. Action that violates a culture's general expectations regarding socially appropriate behavior.

convergent thinking. Process of pulling together several pieces of information to draw a conclusion or solve a problem.

cooperative learning. Approach to instruction in which students work with a small group of peers to achieve a common goal and help one another learn.

coping model. Model who initially struggles with a task but successfully overcomes obstacles.

correlation coefficient. Statistic that indicates the strength and direction of an association between two variables.

correlational study. Research study that explores possible associations among two or more variables.

cortex. Upper part of the brain; primary site of complex, conscious thinking processes.

covert strategy. Learning strategy that is strictly mental (rather than behavioral) in nature and thus cannot be directly observed by others.

creativity. New and original behavior that yields a productive and culturally appropriate result.

criterion-referenced assessment. Assessment instrument designed to determine what students know and can do relative to predetermined standards or criteria.

criterion-referenced score. Assessment score that specifically indicates what a student knows or can do.

critical thinking. Process of evaluating the accuracy, credibility, and worth of information and lines of reasoning.

crowd. Large, loose-knit social group that shares certain common interests and behaviors.

crystallized intelligence. Knowledge and skills accumulated from prior experience, schooling, and culture.

cueing. Use of a verbal or nonverbal signal to indicate that a certain behavior is desired or that a certain behavior should stop.

cultural bias. Extent to which assessment tasks either offend or unfairly penalize some students because of their ethnicity, gender, or socioeconomic status.

cultural mismatch. Situation in which a student's home culture and the school culture hold conflicting expectations for behavior.

culturally responsive teaching. Use of instructional strategies that build on students' existing knowledge and skills and that accommodate their accustomed ways of behaving and learning.

culture. Behaviors and belief systems that members of a longstanding social group share and pass along to successive generations.

culture of transfer. Learning environment in which applying school subject matter to new situations, cross-disciplinary contexts, and real-world problems is both the expectation and the norm.

culture shock. Sense of confusion when a student encounters a new environment with behavioral expectations very different from those previously learned.

curriculum-based measurement (CBM). Use of frequent assessments to track students' progress in acquiring basic skills; assessments are typically quite short (e.g., one to four minutes) and each focus on a specific skill.

cyberbullying. Engaging in psychological aggression via wireless technologies, social media, or the Internet.

debilitating anxiety. Anxiety of sufficient intensity that it interferes with performance.

decay. Gradual weakening of information stored in long-term memory, especially if the information is used infrequently or not at all.

declarative knowledge. Knowledge concerning the nature of how things are, were, or will, or might be.

delay of gratification. Ability to forego small, immediate reinforcers in order to obtain larger ones later on.

deliberate practice. An instructional technique in which students are provided with practice questions, receive immediate feedback, and correct errors throughout the process.

descriptive study. Research study that enables researchers to draw conclusions about the current state of affairs regarding an issue but not about correlation or cause-and-effect relationships.

developmental milestone. Appearance of a new, more advanced behavior that indicates significant progress in a child's development.

dialect. Form of a language that has certain unique pronunciations, idioms, and grammatical structures and is characteristic of a particular region or ethnic group.

differentiated instruction. Practice of individualizing instructional methods—and possibly also individualizing specific content and instructional goals—to align with each student's existing knowledge, skills, and needs.

digital footprint. The information or data that remains on the internet, potentially indefinitely.

direct instruction. Approach to instruction that uses a variety of techniques (e.g., explanations, questions, guided and independent practice) in a fairly structured manner to promote learning of fundamental knowledge and skills.

discovery learning. Approach to instruction in which students construct their own knowledge about a topic through firsthand interaction with an aspect of their environment.

discrimination. Phenomenon in which a student learns that a response is reinforced in the presence of one stimulus but not in the presence of another, similar stimulus.

disequilibrium. State of being unable to address new events with existing schemes; typically accompanied by some mental discomfort.

disposition. General inclination to approach and think about learning and problem-solving tasks in a particular way; typically has a motivational component in addition to cognitive components.

distal goals. Long-term goals that students hope to reach over an extended period of time.

distance learning. Technology-based instruction in which students are at a location physically separate from that of their instructor.

distributed cognition. Enhancement of thinking through the use of physical objects and technology, concepts and symbols of one's culture, and/or social collaboration and support.

distributed intelligence. Enhancement of thinking through the use of physical objects and technology, concepts and symbols of one's culture, and/or social collaboration and support.

distributed knowledge. Distribution of expertise across various members of a social group, such that group members must rely on one another to maximize their personal and collective success.

divergent thinking. Process of mentally moving in a variety of directions from a single idea.

dynamic assessment. Systematic examination of how easily and in what ways a student can acquire new knowledge or skills, usually within the context of instruction or scaffolding.

dyslexia. Inability to master basic reading skills in a developmentally typical time frame despite normal reading instruction; often has biological roots.

e-learning. Instruction and learning that occur largely or entirely within the context of digital technologies.

educational psychology. Academic discipline that (a) systematically studies the nature of learning, child development, motivation, and related topics and (b) applies its research findings to the identification and development of effective classroom practices.

effortful control. One's general ability to inhibit immediate impulses in order to think and act productively; believed to be a distinct aspect of temperament that has a biological basis in the brain.

elaboration. Cognitive process in which learners embellish on new information based on what they already know or believe.

electronic portfolio (e-folio). Portfolio compiled and available for inspection on a CD, DVD, flash drive, Internet-based storage service, or other electronic storage mechanism.

emergent literacy. Knowledge and skills that lay a foundation for reading and writing; typically develops from early experiences with written language.

emotion regulation. Process of keeping in check or intentionally altering feelings that might lead to counterproductive behavior.

emotional and behavioral disorders. Emotional states and behavior patterns that consistently and significantly disrupt academic learning and performance.

empathy. Experience of sharing the same feelings as someone in unfortunate circumstances.

encoding. Mentally changing the format of new information in order to think about it or remember it more easily.

engagement. the quality and quantity of attention, involvement, effort, and participation evidenced by students while they are learning and working on academic tasks.

English language learner (ELL). School-age child who is not fully fluent in English because of limited exposure to English prior to enrollment in an English-speaking school.

epistemic belief. Belief about the nature of knowledge or knowledge acquisition.

epistemic cognition. the ability to think about the nature of knowledge (i.e., whether factual knowledge is a certainty, or whether knowledge is subjective and debatable).

equilibration. Movement from equilibrium to disequilibrium and back to equilibrium, a process that promotes development of more complex thought and understandings.

equilibrium. State of being able to address new events with existing schemes.

ethnic group. People who have common historical roots, values, beliefs, and behaviors and who share a sense of interdependence.

ethnic identity. Awareness of one's membership in a particular ethnic or cultural group, and willingness to adopt behaviors characteristic of the group.

Every Student Succeeds Act (ESSA). Act passed in 2015 to replace the No Child Left Behind Act; mandates use of effective instructional practices that prepare students for the future; also mandates statewide assessments and school improvement.

evidence-based practice. Instructional method or other classroom strategy that research has consistently shown to bring about significant gains in students' development and/or academic achievement.

executive functions. General mental processes that humans use to control what they pay attention to, think about, and learn; are presumed to occur within working memory.

expectancy. Belief about the likelihood of success in an activity, given present ability levels and external circumstances that may either help or hinder performance.

experimental study. Research study that involves both (a) the manipulation of one variable to determine its possible effect on another variable and (b) control of additional variables that might potentially have an impact on the outcome; allows conclusions about cause-and-effect relationships.

explicit knowledge. Knowledge that a person is consciously aware of and can verbally describe.

expository instruction. Approach to instruction in which information is presented in essentially the same form in which students are expected to learn it.

externalizing behavior. Symptom of an emotional or behavioral disorder that has a direct effect on other people (e.g., aggression, lack of self-control).

extinction. Gradual disappearance of an acquired response. In classical conditioning, it results from repeated presentation of a conditioned stimulus in the absence of the unconditioned stimulus; in instrumental conditioning, it results from repeated lack of reinforcement.

extrinsic motivation. Motivation resulting from factors external to the individual and unrelated to the task being performed.

extrinsic reinforcer. Reinforcer that comes from the outside environment, rather than from within the learner.

facilitating anxiety. Level of anxiety (usually relatively low) that enhances performance.

Family Educational Rights and Privacy Act (FERPA). U.S. legislation passed in 1974 that gives students and parents access to school records and limits other people's access to those records.

fixed mindset. Belief that one simply does not have the ability to learn in some areas.

flow. Intense form of intrinsic motivation, involving complete absorption in and concentration on a challenging activity.

fluid intelligence. Ability to acquire knowledge quickly and adapt effectively to new situations.

formal assessment. Preplanned, systematic attempt to ascertain what students know and can do.

formal discipline. View of transfer reflecting the idea that the study of rigorous subject matter enhances one's ability to learn other, unrelated things.

formal operational egocentrism. Inability of adolescents in Piaget's formal operations stage to separate their own abstract logic from the perspectives of others and from practical considerations.

formal operations stage. Piaget's fourth and final stage of cognitive development, in which logical reasoning processes can be applied to abstract ideas as well as to concrete objects.

formative assessment. Assessment conducted before or during instruction to facilitate instructional planning and enhance students' learning.

functional analysis. Examination of inappropriate behavior and its antecedents and consequences to determine one or more purposes (functions) that the behavior might serve for the learner.

g. Theoretical general factor in intelligence that influences one's ability to learn and perform in a wide variety of contexts.

gang. Cohesive social group characterized by initiation rites, distinctive colors and symbols, territorial orientation, and feuds with rival groups.

gender fluidity. flexibility in the ways in which an individual describes their gender.

gender nonconformity. The tendency to not conform to traditional societal expectations of behavior associated with being either female or male.

gender schema. Self-constructed, organized body of beliefs about characteristics and behaviors of males or females.

general transfer. Instance of transfer in which the original learning task and the transfer task are different in content.

generalization. Phenomenon in which a person learns a response to a particular stimulus and then makes the same response to a similar stimulus. In classical conditioning, it involves making a conditioned response to a stimulus similar to a conditioned stimulus; in instrumental conditioning, it involves making a voluntary response to a stimulus that is similar to one previously associated with a response–reinforcement contingency.

giftedness. Unusually high ability or aptitude in one or more areas, to such a degree that students require special educational services to help them meet their full potential.

glial cell. Cell in the brain that supports neurons or general brain functioning.

goodness of fit. Situation in which classroom conditions and expectations are compatible with students' temperaments and personality characteristics.

grade-equivalent score. Test score that matches a particular student's performance with the average performance of students at a certain grade level.

group contingency. Situation in which everyone in a group must make a particular response before reinforcement occurs.

group differences. Consistently observed differences (on average) among diverse groups of students (e.g., students of different genders or ethnic backgrounds).

growth mindset. Belief that one has the ability to learn, even about complex topics, if one practices much and works hard.

guided participation. Process in which a child gains new skills by working on a complex, meaningful task in close collaboration with an adult or more experienced peer.

guilt. Feeling of discomfort about having caused someone else pain or distress.

halo effect. Phenomenon in which people are more likely to perceive positive behaviors in someone they like or admire.

hearing loss. Malfunction of the ears or associated nerves that interferes with perception of sounds within the frequency range of normal human speech.

heuristic. General strategy that facilitates problem solving but doesn't always yield a viable solution.

high functioning autism. a mild form of autism spectrum disorder characterized by normal language skills and average to above-average intelligence.

high-stakes testing. Practice of using students' performance on a single assessment to make major decisions about students, school personnel, or overall school quality.

higher-level question. Question that requires students to use previously learned information in a new way—that is, to engage in one or more complex cognitive processes.

holistic scoring. Summarizing a student's performance on an assessment with a single score.

horns effect. Phenomenon in which people are more likely to perceive negative behaviors in someone for whom they have little affection or respect.

hostile attributional bias. Tendency to interpret others' behaviors as reflecting hostile or aggressive intentions.

hot cognition. Learning or cognitive processing that is emotionally charged.

hypermedia. Collection of computer-based and electronically linked multimedia materials (e.g., text, pictures, sound, animations) that students can examine in a sequence of their own choosing.

I-message. Statement that communicates the adverse effects of a student's misbehavior, including one's own reactions to it, in a calm, relatively nonaccusatory manner; its intent is to convey information, not to lay blame.

identity. Self-constructed definition of who one is and what things are important to accomplish in life.

ill-defined problem. Problem in which the desired goal is unclear, some information needed to solve the problem is missing, and/or several possible solutions to the problem may exist.

illusion of knowing. Thinking one knows something that one actually does *not* know.

imaginary audience. Belief that one is the center of attention in any social situation.

immersion. Second-language instruction in which students hear and speak that language almost exclusively in the classroom.

implicit knowledge. Knowledge that a person cannot consciously recall or explain but that nevertheless affects the person's thinking or behavior.

incentive. Hoped-for, but not guaranteed, future consequence of behavior.

inclusion. Practice of educating all students, including those with severe and multiple disabilities, in neighborhood schools and general education classrooms.

incompatible behaviors. Two or more behaviors that cannot be performed simultaneously.

individual constructivism. Theoretical perspective that focuses on how learners each construct their own idiosyncratic meanings from their experiences.

individual differences. Diversity in abilities and characteristics (intelligence, personality, etc.) among students at a particular age and within a particular gender or cultural group.

individualized education program (IEP). Written description of an appropriate instructional program for a student with special needs.

Individuals with Disabilities Education Act (IDEA). U.S. federal legislation granting educational rights from birth until age 21 for people with cognitive, emotional, or physical disabilities.

induction. Explanation of why a certain behavior is unacceptable, often with a focus on the pain or distress that someone has caused another.

informal assessment. Assessment that results from a teacher's spontaneous, day-to-day observations of how a student performs in class.

information literacy. Knowledge and skills that help a learner find, use, evaluate, organize, and present information about a particular topic.

information-processing theory. Theoretical perspective that focuses on the specific ways in which learners mentally think about, or process, new information and events.

inner speech. Process of talking to and guiding oneself mentally rather than aloud.

inquiry learning. Approach to instruction in which students apply complex reasoning skills in their examination and interpretation of new phenomena and data sources.

instructional goal. Desired long-term outcome of instruction.

instructional objective. Desired outcome of a lesson or unit.

instrumental conditioning. Learning process in which a response either increases or decreases as a result of being followed by either reinforcement or punishment, respectively.

intellectual disability. Disability characterized by significantly below-average general intelligence and deficits in adaptive behavior, both of which first appear in infancy or childhood.

intelligence. Ability to apply prior knowledge and experiences flexibly to accomplish challenging new tasks.

intelligence test. General measure of current level of cognitive functioning; often used to predict academic achievement in the short run.

intelligent tutoring system. Computer software program that provides individually tailored instruction and practice, supplemented with ongoing guidance and feedback, related to a particular topic and set of skills.

interdisciplinary instruction. Instruction in which concepts and ideas from two or more distinct academic domains (e.g., science and writing, or mathematics and social studies) are blended within a single lesson or, more generally, across the curriculum.

interest. Perception that an activity is intriguing and enticing; typically accompanied by both cognitive engagement and positive affect.

interference. Phenomenon whereby something stored in long-term memory inhibits one's ability to remember something else correctly.

interleaved practice. Instructional strategy in which a teacher mixes several different kinds of problems within a single learning activity, thereby requiring students to consciously think about which problem-solving strategy would be appropriate for each one; tends to minimize the influence of unproductive mental sets during the activity.

intermittent reinforcement. Reinforcement of a response only occasionally, with some occurrences of the response *not* being reinforced.

interval schedule of reinforcement. Once a behavior has occurred, a stimulus or consequence is presented to the learner after a certain period of time has passed, in order to increase the frequency of the behavior.

internal organization. Cognitive process in which learners make connections among various pieces of information they need to learn (e.g., by forming categories, identifying hierarchies, determining cause-and-effect relationships).

internalization. Process through which a learner gradually incorporates socially based activities into his or her internal cognitive processes.

internalized motivation. Adoption of other people's priorities and values as one's own.

internalizing behavior. Symptom of an emotional or behavioral disorder that adversely affects the student with the disorder but has little or no direct effect on other people (e.g., depression, social withdrawal).

intersectionality. The consideration of the complexity and diversity of students' identities.

intrinsic motivation. Motivation resulting from internal personal characteristics or inherent in the task being performed.

intrinsic reinforcer. Reinforcer that is provided by the learner or inherent in the task being performed.

IQ score. Score on an intelligence test, determined by comparing a person's performance on the test with that of others in the same age-group; for most tests, it's a standard score with a mean of 100 and a standard deviation of 15.

IRE cycle. Adult–child interaction marked by adult initiation (usually involving a question), child response, and adult evaluation.

item analysis. Follow-up analysis of patterns in students' responses to various items in an assessment.

item difficulty (p). Index reflecting the proportion of students getting a particular assessment item correct.

item discrimination (D). Index reflecting the relative proportion of high-scoring versus low-scoring students getting a particular assessment item correct.

jigsaw technique. Instructional technique in which materials are divided among members of a cooperative group, with different students being responsible for learning different content and teaching it to other group members.

keyword method. Mnemonic technique in which a learner mentally connects two ideas by forming a visual image of one or more concrete objects (*keywords*) that either sound similar to or symbolically represent those ideas.

knowledge base. One's existing knowledge about specific topics and the world in general.

knowledge building. Process in which students work together to construct jointly held understandings about a particular topic; students contribute their own ideas, critique and build on one another's ideas, create tangible products relevant to the topic, and offer various theories, problem-solving strategies, and other cognitive tools that can enhance one another's thinking about the topic.

knowledge telling. Writing ideas in whatever order they come to mind, with little regard for communicating the ideas effectively.

knowledge transforming. Writing about ideas in a manner that intentionally helps a reader comprehend them.

language comprehension. The auditory processing of language (i.e., language that one hears) as well as the decoding of language (i.e., attaching meaning to words and sentences).

language processing. The process that the brain uses to allow humans to understand language as it is used in conversations.

learned helplessness. General, fairly pervasive belief that one is incapable of accomplishing tasks and has little or no control of the environment.

learner-directed instruction. Approach to instruction in which students have considerable control regarding the issues they address and the ways they address them.

learning. Long-term change in mental representations or associations as a result of experience.

learning disabilities. Deficiencies in one or more specific cognitive processes but not in overall cognitive functioning.

learning strategy. One or more cognitive processes used intentionally for a particular learning task.

least restrictive environment. Most typical and standard educational environment that can reasonably meet the needs of a student with a disability.

legitimate peripheral participation. Participation at the fringe of a community of practice as a way of gaining knowledge and skills related to the group's typical ways of doing things.

lesson plan. Predetermined guide for a lesson that identifies instructional goals or objectives, necessary materials, instructional strategies, and one or more appropriate assessments.

level of potential development. Upper limit of tasks that a learner can successfully perform with the assistance of a more competent individual.

literacy. In general, proficiency with the various concepts and symbols associated with a particular knowledge domain (e.g., in written language, mathematics, or music).

long-term memory. Component of memory that holds knowledge and skills for a relatively long time.

lower-level question. Question that requires students to retrieve and recite what they have learned in essentially the same form that they learned it.

maintenance rehearsal. Rapid repetition of a small amount of information to keep it fresh in working memory.

mastery-approach goal. Desire to acquire new knowledge and master new skills.

mastery-avoidance goal. Desire to avoid misunderstanding what one is learning.

mastery goal. Desire to understand and become proficient at what one is learning.

mastery learning. Approach to instruction in which students learn one topic thoroughly before moving to a subsequent one.

maturation. Gradual, genetically driven acquisition of more advanced physical and neurological capabilities over the course of childhood and adolescence.

mean (M). Mathematical average of a set of scores.

meaningful learning. Cognitive process in which learners relate new information to what they already know.

meaningful learning set. Earnest and ongoing effort to make sense of the information one is studying.

mediated learning experience. Discussion between an adult and a child in which the adult helps the child make sense of an event they are mutually experiencing.

memory. Ability to mentally save something that has been previously learned; also, the mental "location" where such information is saved.

mental set. Inclination to encode a problem in a way that excludes potential solutions.

metacognition. Knowledge and beliefs about the nature of human cognitive processes (including one's own), as well as conscious attempts to engage in behaviors and thought processes that increase learning and memory.

metalinguistic awareness. Ability to think consciously about the nature and functions of language.

microraggression. Brief statements or behaviors that seem harmless to some individuals, but are perceived as insulting or derogatory by others.

mindset. Personal beliefs about one's ability to learn new information or skills.

mirror neuron. Neuron in the brain that fires either when a person is performing a particular behavior or when the person sees someone else perform the behavior.

misbehavior. Action that disrupts learning and planned classroom activities, puts students' physical safety or psychological well-being in jeopardy, or violates basic moral standards.

misconception. Belief that is inconsistent with commonly accepted and well-validated explanations of phenomena or events.

mixed-methods study. Research study that includes elements of both quantitative and qualitative research.

mnemonic. Memory aid or trick designed to help students learn and remember one or more specific pieces of information.

model. In science, physical or symbolic representation of a phenomenon that depicts its key components and important interrelationships. In social cognitive theory, real or fictional individual who demonstrates a behavior that learners might emulate; alternatively, a set of instructions for successfully executing the behavior.

modeling. Demonstrating a behavior for another person *or* observing and imitating another person's behavior.

moral dilemma. Situation in which two or more people's rights or needs may be at odds and the morally correct action is not clear-cut.

moral transgression. Action that causes harm or infringes on the needs or rights of others.

morality. One's general standards regarding right and wrong behaviors.

motivation. Inner state that energizes, directs, and sustains behavior.

multi-tiered system of support (MTSS). Systematic, schoolwide approach in which students' academic and/or behavioral difficulties are addressed with three or more distinct levels of intervention and support, with individual students being moved from one level to another as their current abilities and needs require.

multicultural education. Instruction that integrates the perspectives and experiences of numerous cultural groups throughout the curriculum.

myelination. Growth of a fatty sheath (myelin) around the axons of neurons, enabling faster transmission of electrical impulses.

NCE score (normal-curve-equivalent score). Standard score with a mean of 50 and a standard deviation of 21.06; an NCE score of 1 equals a percentile rank of 1, and an NCE score of 99 equals a percentile rank of 99.

need for arousal. Ongoing need for either physical or cognitive stimulation.

need for autonomy. Basic need to believe that one has some control regarding the course of one's life.

need for competence. Basic need to believe that one can deal effectively with one's overall environment.

need for relatedness. Basic need to feel socially connected to others and to secure others' love and respect.

negative reinforcement. Consequence that brings about the increase of a behavior through the removal (rather than the presentation) of a stimulus.

negative transfer. Phenomenon in which something learned at one time interferes with learning or performance at a later time.

neglected student. Student about whom most peers have no strong feelings, either positive or negative.

neo-Piagetian theory. Theoretical perspective that combines elements of Piaget's theory with more contemporary research and theories and suggests that development in specific content domains is often stagelike in nature.

neuron. Cell in the brain or another part of the nervous system that transmits information to other cells.

neuropsychology. Study of how various brain structures and functions are related to human learning and behavior; also known as *cognitive neuroscience*.

neurotransmitter. Chemical substance through which one neuron sends a message to another neuron.

neutral stimulus. Stimulus that does not presently elicit any particular response.

No Child Left Behind Act (NCLB). U.S. legislation passed in 2001 that mandates regular assessments of basic skills to determine whether students are making adequate yearly progress relative to state-determined standards in reading, math, and science.

norm group. Group of individuals to which a student's performance on an assessment is compared; is ideally composed of many people who, together, represent the diversity of the nation's population.

norm-referenced assessment. Assessment instrument that indicates how students perform relative to a peer group.

norm-referenced score. Assessment score that indicates how a student's performance compares with the performance of others.

normal distribution (normal curve). Theoretical pattern of educational and psychological characteristics in which most individuals score in the middle range and only a few score at either extreme.

norms. In assessment, data regarding the typical performance of various groups of students on a standardized test or other norm-referenced measure of a particular characteristic or ability.

online or distance learning. Approach to instruction in which students engage in interactive learning activities on the Internet.

operant conditioning. Learning process in which a response increases as a result of being followed by reinforcement; is one form of *instrumental conditioning*.

organization. Cognitive process in which learners make connections among various pieces of information they need to learn (e.g., by forming categories, identifying hierarchies, determining cause and- effect relationships).

outcome expectation. Prediction regarding the consequence that a particular behavior is likely to yield.

overt strategy. Learning strategy that is at least partially evident in a learner's behavior (e.g., taking notes during a lecture).

pedagogical content knowledge. Knowledge about effective methods of teaching a specific topic or content area.

peer contagion. Phenomenon in which certain behaviors, attitudes, and/or values spread from one child or adolescent to another, perhaps through modeling, peer reinforcement, social sanctions, or self-socialization.

peer mediation. Approach to conflict resolution in which a student (serving as a *mediator*) asks peers in conflict to express their differing viewpoints and then work together to devise a reasonable resolution.

peer tutoring. Approach to instruction in which one student provides instruction to help another student master a classroom topic.

people-first language. Language usage in which a student's disability is identified *after* the student is named.

percentile score (percentile). Test score indicating the percentage of peers in the norm group getting a raw score less than or equal to a particular student's raw score.

performance-approach goal. Desire to look good and receive favorable judgments from others.

performance assessment. Assessment in which students demonstrate their knowledge and skills in a nonwritten fashion.

performance-avoidance goal. Desire not to look bad or receive unfavorable judgments from others.

performance goal. Desire to demonstrate one's ability relative to others.

personal development. Development, with age, of distinctive behavioral patterns and increasingly complex self-understandings.

personal fable. Belief that one is completely unlike anyone else and so cannot be understood by others.

personal interest. Long-term, relatively stable interest in a particular topic or activity.

personal space. Personally or culturally preferred distance between people during social interaction.

personal theory. Personally constructed, integrated set of concepts and principles developed to explain a particular phenomenon; may or may not be consistent with a well-established scientific theory.

personality. Characteristic ways in which a particular individual behaves, thinks, and feels in a wide range of circumstances.

perspective taking. Ability to look at a situation from someone else's viewpoint.

phonological awareness. Ability to hear the distinct sounds of which spoken words are composed.

physical aggression. Action that can potentially cause bodily injury.

physical and health impairment. General physical or medical condition that interferes so significantly with school performance that special accommodations are required.

plasticity. Ability to reorganize in order to adapt to changing circumstances; term often used in describing the human brain.

popular student. Student whom many peers like and perceive to be kind and trustworthy.

portfolio. Collection of a student's work compiled systematically over a lengthy time period.

positive behavioral interventions and supports (PBIS). Variation of traditional applied behavior analysis that involves identifying the purposes of undesirable behaviors and encouraging alternative behaviors that more appropriately accomplish those purposes.

positive reinforcement. Consequence that brings about the increase of a behavior through the presentation (rather than the removal) of a stimulus.

positive transfer. Phenomenon in which something learned at one time facilitates learning or performance at a later time.

postconventional morality. Thinking in accordance with self-constructed, abstract principles regarding right and wrong behaviors.

practicality. Extent to which an assessment instrument or procedure is inexpensive and easy to use and takes only a small amount of time to administer and score.

preconventional morality. Lack of internalized standards about right and wrong behaviors; decision making based primarily on what seems best for oneself.

predictive validity. Extent to which the results of an assessment predict future performance in a particular domain; sometimes called *criterion validity.*

preoperational egocentrism. Inability of children in Piaget's preoperational stage to look at a situation from another person's perspective; reflects a cognitive limitation, *not* a personality flaw.

preoperational stage. Piaget's second stage of cognitive development, in which children can think about objects and events beyond their immediate view but do not yet reason in logical, adult-like ways.

presentation punishment. Punishment involving presentation of a new stimulus, presumably one a learner finds unpleasant.

primary reinforcer. Consequence that satisfies a biologically or psychologically built-in need.

principle. Statement that identifies a fairly consistent finding regarding cause-and-effect related to a particular phenomenon.

prior knowledge activation. Process of reminding learners of what they already know relative to a new topic.

proactive aggression. Deliberate aggression against another as a means of obtaining a desired goal.

problem-based learning. Classroom activity in which students acquire new knowledge and skills while working on a complex problem similar to one that might exist in the outside world.

problem solving. Using existing knowledge and skills to address an unanswered question or troubling situation.

procedural knowledge. Knowledge concerning how to do something (e.g., a skill).

professional learning community. Schoolwide collaborative effort in which teachers and administrators share a common vision for students' learning and achievement and work together to bring about desired student outcomes.

project-based learning. Classroom activity in which students acquire new knowledge and skills while working on a complex, multifaceted project that yields a concrete end product.

prosocial behavior. Behavior directed toward promoting the well-being of people other than oneself.

proximal goal. Concrete goal that can be accomplished within a short time period; may be a stepping stone toward a long-term goal.

psychological aggression. Action intended to cause mental anguish or reduce self-esteem.

psychological control. The extent to which parents exert control over their children through the use of psychological strategies, such as withholding affection or inducing feelings of guilt.

psychological punishment. Consequence that seriously threatens self-esteem and general psychological well-being.

punishment. Consequence (stimulus) that decreases the frequency of the response it follows.

qualitative research. Research yielding information that cannot easily be reduced to numbers; typically involves an in-depth examination of a complex phenomenon.

quantitative research. Research yielding information that is inherently numeric in nature or can easily be reduced to numbers.

quasi-experimental study. Research study that involves the manipulation of one variable to determine its possible effect on another variable, but without total control of additional variables that might have an impact on the outcome.

rating scale. Scoring guide in which different numbers are assigned to different degrees of quality in a student's performance on an assessment.

ratio schedule of reinforcement. Once a behavior has occurred, a stimulus or consequence is presented to the learner after a certain number of responses has occurred, in order to increase the frequency of the behavior.

raw score. Assessment score based solely on the number or point value of correctly answered items.

reactive aggression. Aggressive response to frustration or provocation.

recall task. Assessment task in which one must retrieve information from long-term memory with only minimal retrieval cues.

reciprocal causation. Mutual cause-and-effect relationships among environment, behavior, and personal variables as these three factors influence learning and development.

reciprocal teaching. Approach to fostering reading and listening comprehension skills in which students take turns asking teacher-like questions of classmates.

recognition task. Assessment task in which one must identify correct information among incorrect statements or irrelevant information.

reconstruction error. Construction of a logical but incorrect "memory" by combining information retrieved from one's long-term memory with one's general knowledge and beliefs about the world.

recursive thinking. Thinking about what other people may be thinking about oneself, possibly through multiple iterations.

reflective teaching. Regular, ongoing examination and critique of one's assumptions and instructional strategies, and revision of them as necessary to enhance students' learning and development.

refutation texts. That identify a common misperception that students often hold, refute the misperception with evidence, and explain the new evidence in an easy-to-understand manner.

rehearsal. Cognitive process in which information is repeated over and over within a short time frame (typically a few minutes or less) as a possible way of learning and remembering it.

reinforcer. Consequence (stimulus) of a response that increases the frequency of the response it follows; the act of following a response with a reinforcer is known as **reinforcement.**

rejected student. Student whom many peers identify as being an undesirable social companion.

relational aggression. Action that can adversely affect interpersonal relationships; a form of psychological aggression.

reliability. Extent to which an assessment yields consistent information about the knowledge, skills, or characteristics being assessed.

removal punishment. Punishment involving withdrawal of an existing stimulus, presumably one a learner doesn't want to lose.

resilient student. Student who succeeds in school and in life despite exceptional hardships at home.

response (R). Specific behavior that an individual exhibits.

response cost. Loss either of a previously earned reinforcer or of an opportunity to obtain reinforcement.

response to intervention (RTI). Approach to diagnosing significant learning difficulties in which students are identified for in-depth assessment after failing to master certain basic skills despite evidence-based whole-class and small-group instructional practices.

retrieval. Mental process of finding information previously stored in memory.

retrieval cue. Stimulus that provides guidance about where to "look" for a piece of information in long-term memory.

rote learning. Learning information in a relatively uninterpreted form, without making sense of it or attaching much meaning to it.

rubric. Two-dimensional table that includes two or more characteristics on one dimension and concrete criteria for rating them on the other dimension; useful in evaluating a multifaceted performance or product.

scaffolding. Support mechanism that helps a learner successfully perform a challenging task (i.e., a task within the learner's zone of proximal development).

schema. Tightly organized set of facts about a specific topic.

scheme. Organized group of similar actions or thoughts that are used repeatedly in response to the environment.

scholastic aptitude test. Test designed to assess a general capacity to learn and used to predict future academic achievement.

school readiness test. Test designed to assess cognitive skills important for success in a typical kindergarten or first-grade curriculum.

schoolwide positive behavioral interventions and supports (SWPBIS). Systematic use of behaviorist principles to encourage and reinforce productive behaviors in all students; typically involves multiple layers of support in order to accommodate the varying needs and behavior patterns of different students.

scorer reliability. Extent to which different people agree in their judgments of students' performance on an assessment; sometimes called *interrater reliability*.

script. Schema that involves a predictable sequence of events related to a common activity.

scripted cooperation. Technique in which cooperative learning groups follow a specified set of steps, or script, that guides members' verbal interactions.

secondary reinforcer. Consequence that becomes reinforcing over time through its association with another reinforcer.

self-conscious emotion. Affective state based on self-evaluations regarding the extent to which one's actions meet society's standards for appropriate and desirable behavior; examples are pride, guilt, and shame.

self-efficacy. Belief that one is capable of executing certain behaviors or reaching certain goals.

self-evaluation. Process of judging one's own performance or behavior.

self-explanation. Process of occasionally stopping to verbalize to oneself (and hence to better understand) material being read or studied.

self-fulfilling prophecy. Situation in which expectations for an outcome either directly or indirectly lead to the expected result.

self-handicapping. Behavior that undermines one's own success as a way of protecting self-worth during potentially difficult tasks.

self-imposed contingency. Self-reinforcement or self-punishment that follows a behavior.

self-instructions. Instructions that one gives oneself while performing a complex behavior.

self-monitoring. Process of observing and recording one's own behavior.

self-questioning. Process of asking oneself questions as a way of checking one's understanding of a topic.

self-regulated behavior. Self-chosen and self-directed behavior that leads to the fulfillment of personally constructed standards and goals.

self-regulated learning. Regulation of one's own cognitive processes and studying behaviors in order to learn successfully.

self-regulated problem solving. Use of self-directed strategies to address complex problems.

self-regulation. Process of setting goals for oneself and engaging in behaviors and cognitive processes that lead to goal attainment.

self-socialization. Tendency to integrate personal observations and others' input into self-constructed standards for behavior and to choose actions consistent with those standards.

self-talk. Process of talking to oneself as a way of guiding oneself through a task.

self-worth. General belief about the extent to which one is a good, capable individual.

sense of community. Shared belief that teacher and students have common goals, are mutually respectful and supportive, and all make important contributions to classroom learning.

sense of school community. Shared belief that all faculty and students within a school are working together to help everyone learn and succeed.

sense of self. Perceptions, beliefs, judgments, and feelings about oneself as a person; includes *self-concept* and *self-esteem.*

sensitive period. Age range during which environmental conditions have an especially strong influence on an aspect of a child's development (you may sometimes see the term *critical period*).

sensory register. Component of memory that holds incoming information in an unanalyzed form for a very brief period of time (2 or 3 seconds at most, depending on the modality).

service learning. Activity that promotes learning and development through contributing to the general betterment of other people and the outside community.

setting event. Complex environmental condition that is likely to evoke certain voluntary behaviors.

severe and multiple disabilities. Combination of two or more disabilities that, taken together, require significant classroom adaptations and highly specialized educational services.

shame. Feeling of embarrassment or humiliation after failing to meet certain standards for moral behavior.

shaping. Process of reinforcing successively closer and closer approximations to a desired terminal behavior.

situated learning. Knowledge, behaviors, and thinking skills acquired and used primarily within certain contexts, with limited or no retrieval and use in other contexts; sometimes involves dependence on physical or social support mechanisms available only in certain contexts.

situational interest. Interest evoked temporarily by something in the environment.

social cognitive theory. Theoretical perspective that focuses on how people learn by observing others and how they eventually assume control over their own behavior.

social constructivism. Theoretical perspective that focuses on people's collective efforts to impose meaning on the world.

social development. Development, with age, of increasingly sophisticated understandings of other people and of society as a whole, as well as increasingly effective interpersonal skills and more internalized standards for behavior.

social information processing. Mental processes involved in making sense of and responding to social events.

social reasoning. the mental processes that are invoked when individuals think, reason, or problem-solve about social situations.

socialization. Process of molding a child's behavior and beliefs to be appropriate for his or her cultural group.

society. Very large, enduring social group that has fairly explicit social and economic structures and collective institutions and activities.

sociocognitive conflict. Situation in which one encounters and has to wrestle with ideas and viewpoints inconsistent with one's own.

sociocultural theory. Theoretical perspective emphasizing the importance of society and culture in promoting learning and development.

socioeconomic status (SES). One's general social and economic standing in society; encompasses family income, occupation, and educational level.

specific aptitude test. Test designed to predict future ability to succeed in a particular content domain.

specific language impairment. Disability characterized by abnormalities in the production or comprehension of spoken language, to the point that special educational services are required.

specific transfer. Instance of transfer in which the original learning task and the transfer task overlap in content.

speech and communication disorders. Impairments in spoken language or language comprehension that significantly interfere with classroom performance.

standard deviation (SD). Statistic indicating the amount of variability characterizing a set of scores.

Standard English. Form of English generally considered acceptable at school, as reflected in textbooks and grammar instruction.

standard error of measurement (SE). Statistic estimating the amount of error in a test score or other assessment result.

standard score. Test score indicating how far a student's performance is from the mean in terms of standard deviation units.

standardization. Extent to which an assessment involves similar content and format and is administered and scored similarly for everyone.

standardized test. Test developed by test construction experts and published for use in many different schools and classrooms.

stanine. Standard score with a mean of 5 and a standard deviation of 2; always reported as a whole number between 1 and 9.

state anxiety. Temporary feeling of anxiety elicited by a threatening situation.

stereotype. Rigid, simplistic, and erroneous view of a particular group of people.

stereotype threat. Awareness of a negative stereotype about one's own group and accompanying uneasiness that low performance will confirm the stereotype; leads (often unintentionally) to lower-quality performance.

stimulus (S). Specific object or event that influences an individual's learning or behavior.

storage. Mental process of putting new information into memory.

students at risk. Students with a high probability of failing to acquire the minimal academic skills necessary for success in the adult world.

students with special needs. Students different enough from their peers that they require specially adapted instructional materials and practices to maximize their learning and achievement.

subculture. Group that resists the ways of the dominant culture and adopts its own norms for behavior.

subtractive bilingualism. Phenomenon in which complete immersion in a new-language environment leads to deficits in a child's native language.

summative assessment. Assessment conducted after instruction to assess students' final achievement.

superimposed meaningful structure. Familiar shape, word, sentence, poem, or story imposed on information in order to facilitate recall.

sympathy. Feeling of sorrow for another person's distress, accompanied by concern for the person's well-being.

synapse. Junction between two neurons that allows transmission of messages from one to the other.

synaptic pruning. Universal process in brain development in which many previously formed but rarely used synapses gradually wither away.

synaptogenesis. Universal process in brain development in which many new synapses form spontaneously.

synchronous collaboration. Online collaborative activities in which individuals interact with each other in real time.

synchronous online learning. A format of online learning in which the teacher and the students interact with each other in real time, just as if they were in a regular face-to-face classroom.

table of specifications. Two-way grid indicating the topics to be covered in an assessment and the things students should be able to do with those topics.

target behavior. Specific, concrete response that a teacher or therapist wants to either increase or decrease by means of a systematic intervention.

task analysis. Process of identifying the specific behaviors, knowledge, or cognitive processes necessary to master a particular topic or skill.

task value. Belief regarding the extent to which an activity has direct or indirect benefits.

teachable moment. Situation or event (often unplanned) in which students might be especially predisposed to acquire particular knowledge or skills.

teacher accountability. Practice of using students' achievement test scores as measures of a teacher's effectiveness in the classroom.

teacher-developed assessment. Assessment tool developed by an individual teacher for use in a specific classroom.

teacher-directed instruction. Approach to instruction in which the teacher is largely in control of the content and course of the lesson.

technological literacy. Generalizable knowledge about how to effectively use computer applications, other digital technologies, and the Internet.

temperament. Genetic predisposition to respond in particular ways to one's physical and social environments.

test anxiety. Excessive anxiety about a particular test or about assessment in general.

testwiseness. Test-taking know-how that enhances test performance.

test–retest reliability. Extent to which a particular assessment instrument yields similar results over a short time interval.

theory. Integrated set of concepts and principles developed to explain a particular phenomenon; may be constructed jointly by researchers over time or individually by a single learner; in science, usually supported by considerable empirical evidence.

theory of mind. Self-constructed understanding of one's own and other people's mental and psychological states (thoughts, feelings, etc.).

threat. Situation in which a learner believes there is little or no chance of success.

time on task. Amount of time that students are both physically and cognitively engaged in a learning activity.

time-out. Consequence for misbehavior in which a learner cannot interact with others and has no opportunity to receive the kinds of reinforcement to which classmates have access.

token economy. Technique in which desired behaviors are reinforced by small, insignificant items (tokens) that learners can use to "purchase" a variety of other, more desirable reinforcers.

traditional assessment. Assessment that focuses on measuring basic knowledge and skills in relative isolation from activities typical of the outside world.

trait anxiety. General pattern of responding with anxiety even in nonthreatening situations.

transfer. Phenomenon in which something a person has learned at one time affects how the person learns or performs in a later situation.

unconditioned response (UCR). Response that is already elicited by a particular (unconditioned) stimulus in the situation at hand.

unconditioned stimulus (UCS). Stimulus that already elicits a particular response in the situation at hand.

universal design. An approach to instruction that provides flexibility in the presentation of content, to meet the needs of all students.

universals. Similar patterns in how children change and progress over time, regardless of their specific environment.

validity. Extent to which an assessment actually measures what it is intended to measure and allows appropriate inferences about the characteristic or ability in question.

value-added assessment. Approach to evaluating teacher and school effectiveness based on students' academic progress rather than on absolute achievement levels.

verbal mediator. Word or phrase that forms a logical connection, or mental "bridge," between two pieces of information.

vicarious punishment. Phenomenon in which a response decreases in frequency when another person is observed being punished for that response.

vicarious reinforcement. Phenomenon in which a response increases in frequency when another person is observed being reinforced for that response.

visual imagery. Process of forming a mental picture of an object or idea.

visual impairment. Malfunction of the eyes or optic nerves that prevents normal vision even with corrective lenses.

visual–spatial ability. Ability to imagine and mentally manipulate two- and three-dimensional figures.

wait time. Length of time a teacher pauses, after either asking a question or hearing a student's comment, before saying something.

webquest. Structured activity in which students use a number of teacher- or expert-chosen websites to tackle an engaging, challenging task that requires complex cognitive processes (e.g., problem solving, critical thinking).

well-defined problem. Problem in which the goal is clearly stated, all the information needed to solve the problem is present, and only one correct answer exists.

wisdom. the ability to use one's knowledge and skills toward the good of oneself and others.

within-group differences. Variability within any specific group (e.g., a particular gender or cultural group) with respect to particular characteristics and/or behaviors.

withitness. Classroom management strategy in which a teacher gives the impression of knowing what all students are doing at all times.

work-avoidance goal. Desire either to avoid classroom tasks or to complete them with minimal effort, often because of low self-efficacy for the tasks.

working memory. Component of memory that holds and actively thinks about and processes a limited amount of information for a short time.

worldview. General, culturally based set of assumptions about reality that influence understandings of a wide variety of phenomena.

written assessment. Assessment in which students provide written responses to written items.

***z*-score.** Standard score with a mean of 0 and a standard deviation of 1.

zone of proximal development (ZPD). Range of tasks that a learner can perform with the help and guidance of others but cannot yet perform independently.

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CHAPTER 1

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CHAPTER 5

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CHAPTER 8

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CHAPTER 14

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